APPENDIX W

Energy Minimization and Greenhouse Gas Reduction Plan

Prepared by Poseidon, February 2010.
Memorandum prepared by Kennedy/Jenks Consultants, February 2010

Poseidon Resources
Huntington Beach Desalination Plant

ENERGY MINIMIZATION AND GREENHOUSE GAS REDUCTION PLAN

APRIL 30, 2010

Key elements of this Plan include:

- *Poseidon's indirect GHG emissions will be calculated using California Air Resources Board (CARB) or The Climate Registry (TCR) or California Climate Action Registry (CCAR) methodologies.*

- *Poseidon will be credited with emission reductions associated with the replacement of imported water from the State Water Project (SWP).*

- *The offset projects, except for Renewable Energy Credits (RECs), that Poseidon implements pursuant to this Plan will be purchased through/from CARB, CCAR, or any California Air Pollution Control District (APCD) or Air Quality Management District (AQMD).*

POSEIDON
RESOURCES

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APRIL 30, 2010

INTRODUCTION

Poseidon Resources Surfside LLC (Poseidon) is offering The Huntington Beach Energy Minimization and Greenhouse Gas Reduction Plan (the Plan) as part of its voluntary commitment to account for and bring to zero the net indirect Greenhouse Gas (GHG) emissions from the Huntington Beach Desalination Project (Project). Based on protocols adopted by the California Climate Action Registry (CCAR), the Plan is Poseidon's roadmap to achieving its commitment over the 30-year life of the Project. The Plan is consistent with and based on the Energy Minimization and Greenhouse Gas Reduction Plan (and follows the "CCC Emissions Template") approved by the California Coastal Commission (CCC) and the California State Lands Commission (SLC) for the Carlsbad Desalination Project. The Carlsbad GHG Plan was reviewed by the CCC, SLC, the California Air Resources Board (CARB), and the California Energy Commission (CEC) and at the request of the Coastal Commission, the South Coast Air Quality Management District (SCAQMD).

1. Project Overview.

The 50 million gallon per day (MGD) Project (Figure 1) is co-located with the Huntington Beach generation station, which uses seawater for once-through cooling. The Project is being developed as a public-private partnership between Poseidon and local utilities and municipalities.

Figure 1 - Huntington Beach Seawater Desalination Project

In 2006, California legislation introduced the AB 32 Global Warming Solutions Act that aims to reduce statewide GHG emissions to 1990 levels by year 2020. While the legislation and its implementing regulations do not currently apply to the Project because the Project only generates *de minimis* direct GHG emissions[1], Poseidon applauds the objectives of AB 32 and is committed to helping California maintain its leadership role in addressing the causes of Climate Change. As a result, Poseidon has voluntarily committed to offset the net indirect GHG emissions associated with the Project's operations. For the Carlsbad project, Poseidon's offer was incorporated into the Carlsbad project's Coastal Development Permit through Special Condition 10, adopted by the CCC and agreed to by Poseidon, and incorporated into the Project's SLC lease amendment with minor modifications. According to Special Condition 10 and CCC staff direction, Poseidon

[1] AB 32's implementing regulations are currently under-going an extensive public review and drafting process. The process is managed by the California Air Resources Board (CARB). The AB 32 Scoping Plan (the "Scoping Plan") was adopted on December 8, 2008 and a majority of the Plan's measures will be adopted by December 31, 2010. CARB anticipates that most of the regulations and initiatives will go into effect on January 1, 2012. AB 32's regulations, when promulgated, are expected to target direct emitters of GHGs, including SCE (the expected source of the Project's electricity), rather than indirect generators such as the Project. Currently, the Scoping Plan does not anticipate regulation of the Project under AB 32.

submitted a plan for CCC review and approval showing how the Carlsbad project will minimize its electricity use and reduce indirect GHG emissions resulting from net increases in electricity use over existing conditions. In addition to offsetting indirect GHG emissions, the SLC required the Carlsbad project to offset a modest amount of direct GHG emissions associated with project construction and operational vehicles, which are considered *de minimis* under applicable reporting protocols. For the Huntington Beach Project, Poseidon voluntarily submits this Plan, which is consistent with the general obligations of the Carlsbad project's GHG plan, as part of its application materials.

2. **Emissions Template**.

The Emissions Template establishes "a protocol for how to assess, reduce, and mitigate the GHG emissions of applicants," and calls for the organization of relevant information into the following three sections:

1. Identification of the amount of indirect GHGs due to the Project's electricity use;
2. On-Site and Project related measures planned to reduce emissions; and
3. Off-site mitigation options to offset remaining emissions.

After a brief explanation of Poseidon's overall strategy for eliminating the Project's net indirect GHG emissions, this document then organizes the Plan into the three general categories.

3. **Overview of the Project's GHG Reduction Strategy**.

Since offsetting net indirect GHG emissions is an ongoing process dependent on dynamic information, Poseidon's plan for the assessment, reduction and mitigation of GHG emissions establishes a protocol for identifying, securing, monitoring and updating measures to eliminate the Project's net carbon footprint. Once the Project is operational and all measures to reduce energy use at the site have been taken, the protocol involves the following steps, completed each year:

1. Determine the energy consumed by the Project for the previous year using substation(s) electric meter(s) readings from Southern California Edison (SCE) or any other entity from which the Project obtains all or part of its electricity at any time in the future.

2. Determine SCE's reported emissions factor, described as pounds of CO_2 per MWh from delivered electricity, from its most recently published CCAR or The Climate Registry (TCR) Annual Emissions Report. Reports are issued annually and are accessible on the CCAR's website. Emissions factors will be obtained from CARB if and when SCE certified and reported emissions factor for pounds of CO_2 per MWh from delivered electricity is publicly available through CARB's anticipated GHG Inventory program. If at any time in the future the Project obtains all or part of its electricity from an entity other than SCE, the appropriate CCAR, TCR, or CARB reported emissions factor for that entity shall be used.

3. Calculate the Project's gross indirect GHG emissions resulting from Project operations by multiplying its electricity use by the reported emissions factor.

4. Calculate the Project's net indirect GHG emissions by subtracting emissions avoided as a result of the Project (Avoided Emissions) and any existing offset projects and/or Renewable Energy Credits (RECs). Each year's amount of net indirect GHG emissions will be determined using CARB, TCR or CCAR reported emissions factors for SCE and/or the State Water Project (SWP).

5. If necessary, implement carbon offsets projects and purchase carbon offsets or RECs to zero-out the Project's net indirect GHG emissions. Subject to the provisions of Sections III.C, E and F below: (i) Offset projects, except for RECs, implemented pursuant to this Plan will be purchased through/from CARB, CCAR, or a California APCD or AQMD, and (ii) Poseidon may propose purchasing other offset projects in the event that sufficient offsets are not available from CCAR/CARB/California APCD or AQMD at a price that is reasonably equivalent to the price for offsets in the broader domestic market.

Energy efficiency measures and on-site use of renewable resources will be given the highest priority. In addition to the steps completed each year, Poseidon will quantify direct Project GHG emissions associated with project construction and operational vehicles based on data in the Project's 2010 Draft Subsequent Environmental Impact Report (EIR), which are considered *de minimis* under applicable reporting protocols. All such emissions for the entire 30 years of Project operations are quantified and aggregated in Part I of this Plan, and Poseidon shall purchase carbon offsets or RECs to zero-out these emissions on a one-time basis by the time Poseidon submits the first Annual GHG Report required in Part III of this Plan.

The following are elements of the Plan organized in accordance with the emissions template.

PART I. IDENTIFICATION OF THE AMOUNT OF GHG EMITTED

The Project will produce potable water using reverse osmosis membrane separation. The treatment processes used at the Plant do not generate GHGs. The desalination process does not involve heating and vaporization of the source seawater and thus does not create emissions of water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), or sulfur hexafluoride (SF_6). Reverse osmosis membranes do not reject the carbon dioxide, which is naturally dissolved in the source seawater, and this carbon dioxide is retained in dissolved form in the fresh drinking water created by desalination.

The Project will not store or use fossil fuels on site, nor will it emit GHGs from self-generation of electricity. There are no direct fugitive emissions from the plant. As a result, Project operations will not create direct sources of GHG emissions except for emissions from construction and operational vehicles. The modest number of fleet vehicles associated with plant and the construction emissions will create GHG emissions that make-up less than 5% of the Project's annual carbon footprint, and thus these emissions are considered *de minimis* and are not required to be reported (CCAR General Reporting Protocol of March 2007 (Chapter 5)).

However, Poseidon has calculated these emissions and included them in the overall GHG emissions total for the Project.

Data used in the calculation of the construction and operational emissions are derived from the 2010 Draft Subsequent EIR for the Project. GHG emissions were calculated using emissions factors from the CCAR General Reporting Protocol and the South Coast Air Quality Management District's (SCAQMD) web site which were extrapolated out to 30 years where necessary. Table 1 shows emissions from construction equipment, construction site electricity use, and operational emissions from passenger vehicles and delivery trucks during the 30 year life of the project after completion. These emissions amount to less than one percent of the lifetime emissions of the baseline design Project. Poseidon shall make a one-time purchase of carbon offsets or RECs to zero-out the Aggregate 30-Year Construction and Operational GHG Emissions set forth in Table 1 by the time Poseidon submits the first Annual GHG Report required in Part III of this Plan.

Table 1 – Aggregate 30-Year Construction and Operational GHG Emissions

Emission Source	**$MTCO_2e$**
On-site Construction Equipment & Travel	822
Off-site Construction Equipment & Travel	1,229 to 1,233
Construction Site Electricity	136
Post-Construction Operational Passenger Vehicle and Delivery Truck Emissions	4,128
Total	**6,315 to 6,319**

The Project's on-going source of quantifiable GHG emissions will be indirect emissions resulting from purchased electricity. All of the electricity supply for the desalination plant operations is expected to be provided by SCE. Therefore, with the exception of the offsets or RECs for construction and vehicle operations discussed above, the accounting of GHG emissions for the Project addressed in this Plan will consist entirely of indirect emissions resulting from electricity purchased from SCE.

Currently, about 58% of the electricity supplied by SCE is generated from fossil fuels.[2]. As a result, until SCE switches to 100% "green" power supply sources, the Project operations will be indirectly linked to SCE's generation of GHGs.

The Project's total net indirect GHG emissions from the stationary combustion of fossil fuels to generate electricity is dependent on three key factors: (1) how much electricity is used by the Project; (2) sources of energy (fossil fuels, wind, sunlight, etc.) used to generate the electricity

[2] SCE 2008 Power Content Label (16% Eligible Renewables, 12% Coal, 7% Large Hydro, 46% Natural Gas, 19% Nuclear)

supplied to the plant, and (3) the Avoided Emissions, i.e., the amount of energy saved or emissions avoided as a direct result of the Project's operations. These factors will vary over time.

A. Electricity Use by the Project.

The Project will almost always operate, 24 hours a day for 365 days per year, to produce an average annual drinking water flow of 50 million gallons per day (MGD). The power use incorporates both production of fresh drinking water, as well as conveyance and delivery of the water to the distribution systems of the public water agencies that will purchase water from the Project. There are four options for the configuration of the project. The project can either be operated "co-located" with the Huntington Beach Generating Station (HBGS) thereby using warm water, or it can be operated "stand alone" mode without the HBGS operating its cooling water system thereby using cold water. In addition, the project has two options for delivery of the water to the distributions systems – the "primary route" and the "optional route." Each option has a different baseline energy use. Table 2 shows the baseline energy use and total annual electricity use for each potential option.

Table 2 – Baseline Electricity Use By Project Option

Option	Baseline Energy Use (aMW)	MWh/AF	MWh/year
Collocated - Primary Route	33.07	5.2	289,715
Stand Alone - Primary Route	35.01	5.5	306,680
Collocated - Optional Route	34.45	5.4	301,779
Stand Alone - Optional Route	36.39	5.7	318,744

B. SCE's Emissions Factor.

The Project currently intends to purchase all of its electricity from SCE.[3] Accordingly, the appropriate emissions factor to use for the Project's indirect GHG emissions from its electricity use is the independently verified and published emissions factor for the electricity purchased and consumed during the previous year. The certified reported emissions factor for delivered electricity in 2007 is set forth in the utility's Annual Emissions Report published by CCAR in the spring of 2009. In the published Emissions Report, the current certified reported emissions factor for SCE's 2007 delivered electricity is 630.89 lbs of CO_2 per delivered MWH of electricity.

[3] If at any time in the future the Project is able and desires to obtain all or part of its electricity from an entity other than SCE, Poseidon may do so without amending the Plan and the appropriate CCAR reported emissions factor for that entity shall be used.

Circumstances will change over the life of the Project. SCE's reported emissions factors are updated annually and the amount of energy consumed by the Project may change.[4] As a result, it will be necessary to recalculate the net indirect GHG emissions of the Project on an annual basis using the actual SCE reported emissions factor reported to the CCAR (or CARB). Until the mandatory reporting of emissions factors under AB 32 is available, the emissions factors for SCE registered with CCAR are the best available for purposes of planning and permitting this Project.

Statewide initiatives to expand the use of renewable sources of electricity are expected to decrease the emissions factors of all California power suppliers in the future. For example, approximately 16% of SCE's retail electricity is currently generated from renewable resources (solar, wind, geothermal, small hydro and biomass).[5] In their February 2008 SCE Power Bulletin, they stated they hoped to have contracts in place to provide 20% of their customer's energy needs with renewables by 2010. These and other reductions are expected to further reduce the Project's net indirect GHG emissions over time.

Table 3 summarizes the Project's estimated gross indirect CO_2 emissions from purchased electricity for Project operations for each configuration option, based on the most current information.

Table 3 - Identification of Gross Indirect CO_2 Emissions from Purchased Electricity for Project Operations

Option	Total Annual Electricity Use (MWh/year)	Total Annual Emissions (metric tons CO_2/year)
Collocated - Primary Route	289,715	82,908
Stand Alone - Primary Route	306,680	87,763
Collocated - Optional Route	301,779	86,360
Stand Alone - Optional Route	318,744	91,215

PART II: PROJECT AND PROJECT-RELATED REDUCTION OF GHG EMISSIONS

To determine the Project's indirect GHG emissions, on-site and project-related reductions in emissions must also be considered. These are carbon emission reductions that result from measures that reduce energy requirements (increased energy efficiency, potential onsite solar, recovery of CO_2 and green building design), as well as Project-related emissions that will be avoided (Avoided Emissions) as a direct result of the Project and its various components

[4] SCE Annual Emissions Reports to CCAR have changed each year. For years 2004, 2005, 2006 and 2007 the reported emissions factors have been 679, 666, 641, and 631 lbs of CO_2/MWh, respectively.

[5] SCE 2008 Power Content Label. http://www.sce.com/NR/rdonlyres/56AC9CC0-382B-4E1C-BB00-79059037979D/0/2008_SCE_Power_Content_Label.pdf

(replacing Customers' SWP water with water from the Project). The total of each year's indirect GHG emissions will be determined using CARB, CCAR or TCR approved emissions factors for SCE[6] and/or the State Water Project.

A. **Increased Energy Efficiency**.

Poseidon has committed to implement certain measures to reduce the Project's energy requirements and GHG emissions, and will continuously explore new technologies and processes to further reduce and offset the carbon footprint of the Project, such as the use of carbon dioxide from the ambient air for water treatment. These measures are set forth below.

The Project's high-energy efficiency design incorporates state-of-the-art features minimizing plant energy consumption. One such feature is the use of a state-of-the art pressure exchanger-based energy recovery system that allows recovery and reuse of 32.1% of the energy associated with the reverse osmosis (RO) process. A significant portion of the energy applied in the RO process is retained in the concentrated stream. This energy bearing stream (shown with red arrows on Figure 2) is applied to the back side of pistons of cylindrical isobaric chambers, also known as "pressure exchangers" (shown as yellow cylinders on Figure 2). These energy exchangers recover and reuse approximately 45% of the energy used by the RO process.[7]

[6] Or such other entity from whom Poseidon purchases its electricity.

[7] The "45 % percent energy recovery and reuse" refers to the gross energy recovery potential, while the "32.1 % energy recovery and reuse" refers to the actual energy savings associated with the energy recovery system. The difference between gross and actual energy savings is due to mechanical inefficiencies of the recovery system and associated friction losses. Thus, for purposes of calculating the overall energy savings, Tables 4 through 7 correctly reflects the approximate 32% savings associated with the pressure exchanger.

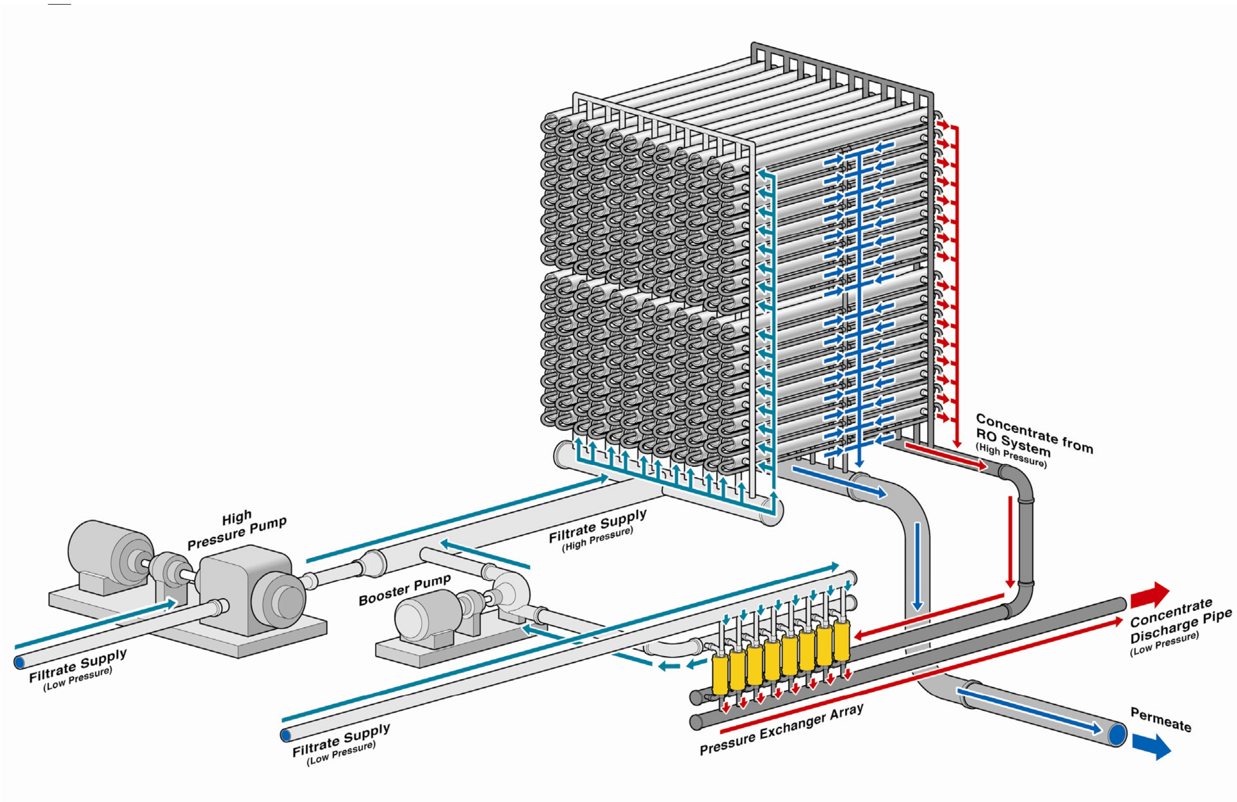

Figure 2 - Energy Recovery System for the Huntington Beach Seawater Desalination Plant

Currently there are no full-scale seawater desalination plants in the US using the proposed state-of-the art pressure exchanger energy recovery technology included in the "High Efficiency Design" (Tables 4 through 7). All existing seawater desalination projects in the US, including the 25 MGD Tampa Bay seawater desalination plant, which recommenced commercial operation in January 2008, are using standard energy recovery equipment – i.e., Pelton wheels (see Figure 3). Therefore, the Pelton wheel energy recovery system is included in the "Baseline Design" in Tables 4 through 7.

The pressure exchanger technology that Poseidon proposes to use for the Project is a national technology. The manufacturer of the pressure exchangers referenced in Tables 4 through 7 of the Project Power Budget is Energy Recovery, Inc., a US company located in San Leandro, California (www.energyrecovery.com).

Figure 3 - Tampa Bay Desalination Plant Pelton Wheel Energy Recovery System

A pilot-scale seawater desalination plant using the pressure exchanger technology proposed by Poseidon and supplied by Energy Recovery, Inc. has been in operation at the US Navy's Seawater Desalination Testing Facility in Port Hueneme, California since 2005. The overall capacity of this desalination plant is 50,000 to 80,000 gallons per day. The pilot testing work at this facility has been conducted by the Affordable Desalination Collaboration (ADC), which is a California non-profit organization composed of a group of leading companies and agencies in the desalination industry (www.affordabledesal.com). A portion of the funding for the operation of this facility is provided by the California Department of Water Resources (DWR) through the state's Proposition 50 Program. The DWR provides independent oversight of this project and reviews project results. In addition, representatives of the California Energy Commission and the California Department of Public Health are on the Board of Directors of the ADC.

The proposed pressure exchanger technology (i.e., the same pressure exchanger employed at the ADC seawater desalination plant) was independently tested at Poseidon's Carlsbad seawater desalination demonstration plant. More than one year of testing has confirmed the validity of the conclusions of the ADC for the site-specific conditions of the Project. The test results from the Carlsbad seawater desalination demonstration plant were used to calculate the energy efficiency of the pressure exchangers included in Tables 4 through 7. Poseidon's technology evaluation work at the Carlsbad seawater desalination demonstration plant was independently reviewed and recognized by the American Academy of Environmental Engineers and by the International Water Association, who awarded Poseidon their 2006 Grand Prize in the field of Applied Research. This technology is the same as the technology used in Poseidon's approved Energy Minimization and Greenhouse Gas Reduction Plan for the Carlsbad Desalination Project.

The following sections describe and compare the baseline design electricity use for each project option to the high efficiency design electricity use for that option. The total actual energy reduction resulting from the use of state-of-the-art desalination and energy recovery technologies and design will be verified by direct readings of the total electricity consumed by the desalination plant at the Project's substation(s) electric meter(s) and documented as soon as the Project is fully operational.

Colocated Primary Route Option

Table 4 - Comparison of Baseline and High-Efficiency Electricity Budget for 50 MGD Water Production Capacity – Colocated Primary Route Option

	Baseline Design - Power Use			High Efficiency Design - Power Use		
Unit	(Hp)	Equip. Effic.	Equipment Type	(Hp)	Equip. Effic.	Equipment Type
Key Treatment Process Pumps						
Power Plant Intake Pumps (Collocated Operation)	0	NA	NA	0	NA	NA
Seawater Intake Pumps	1,650	70%	Standard Motors - No VFDs	1,445	80%	High Eff. Motors - VFDs
Filter Effluent Transfer Pumps	4,450	82%	High Eff. Motors - with VFDs	4,525	82%	High Eff. Motors - with VFDs
High Pressure Reverse Osmosis Pumps	36,960	82%	High Eff. Motors - No VFDs	34,440	88%	High Eff. Motors - No VFDs
Energy Recovery System –						
Power Reduction	-9,280	-25.10%	Pelton Wheels	-11,056	-32.10%	Pressure Exchangers
On-site Product Water Transfer Pumps (50 MGD)	5,538	70%	Standard Motors - No VFDs	4,500	80%	High Eff. Motors - No VFDs
Off-site OC-44 Product Water Pump Station (45 MGD)	2,615	65%	Standard Motors - No VFDs	2,125	80%	High Eff. Motors - No VFDs
Off-site Coastal Junction Product Water Pump Station (26 MGD)	462	65%	Standard Motors – No VFDs	375	80%	High Eff. Motors with VFDs
Pretreatment Filter & Residuals Handling Equipment						
Residuals Transfer Pumps	150	65%	Standard Motors - No VFDs	150	65%	Standard Motors - No VFDs
Residuals Dewatering System	600	70%	Standard Motors - No VFDs	600	70%	Standard Motors - No VFDs
Filter Backwash Blowers	250	70%	Standard Motors - No VFDs	250	70%	Standard Motors - No VFDs
Filter Backwash Pumps	150	70%	Standard Motors - No VFDs	150	70%	Standard Motors - No VFDs
Flocculation Mixers	30	70%	Standard Motors - No VFDs	30	70%	Standard Motors - No VFDs
RO Membrane Cleaning System						
Membrane Cleaning Pumps	13	70%	Standard Motors - No VFDs	13	70%	Standard Motors - No VFDs
Scavenger Tank Mixing System	2	70%	Standard Motors - No VFDs	2	70%	Standard Motors - No VFDs
Flush Pumps	17	70%	Standard Motors - No VFDs	17	70%	Standard Motors - No VFDs
Cleaning Chemical System	15	70%	Standard Motors - No VFDs	15	70%	Standard Motors - No VFDs
Sewer System Transfer Pumps	15	65%	Standard Motors - No VFDs	15	65%	Standard Motors - No VFDs
Chemical Feed Equipment						
Polymer Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Ammonia Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Calcite Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Carbon Dioxide Feed System	1	65%	Standard Motors - No VFDs	1	65%	Standard Motors - No VFDs
Sodium Hypochlorite Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Other Chemical Feed Systems	3	65%	Standard Motors - No VFDs	3	65%	Standard Motors - No VFDs
Service Facilities						
HVAC	70	NA	Standard Equipment	70	NA	Standard Equipment
Lightning	400	NA	Standard Equipment	400	NA	Standard Equipment
Controls and Automation	10	NA	Standard Equipment	10	NA	Standard Equipment
Air Compressors	10	NA	Standard Equipment	10	NA	Standard Equipment
Other Miscellaneous Power Uses	200	NA	Standard Equipment	200	NA	Standard Equipment
TOTAL DESALINATION PLANT HORSEPOWER USE	**44,333**	**Hp**		**38,292**	**Hp**	
TOTAL DESALINATION PLANT POWER USE	**33.07**	**aMW**		**28.57**	**aMW**	

Table 4 presents a detailed breakdown of the projected power use of the Colocated Primary Route option project under a Baseline Design and High-Energy Efficiency Design. As indicated in this table, the Baseline Design includes high efficiency motors for all pumps, except the largest reverse osmosis feed pumps, and a Pelton wheel energy recovery system which is the most widely used "standard' energy recovery system today. The total desalination power use under the Baseline Design is 33.1 aMW, which corresponds to a unit power use of 15.9 kWh/kgal[8] (5,176 kWh/AF)[9].

In addition to the state-of-the-art pressure exchanger system described above, the High-Energy Efficiency Design incorporates premium efficiency motors and variable frequency drives (VFDs) on desalination plant pumps that have motors of 500 horsepower or more. The total desalination plant energy use under the High-Energy Efficiency Design is 28.6 aMW, which corresponds to

[8] 33.07 MWh x 1,000 kW/MW/Average Fresh Water Production Rate of 2083 kg/Hr.

[9] 15.9 kWh/kgal x 326 kgal/AF.

unit power use of 13.7 kWh/kgal[10] (4,471 kWh/AF)[11]. This is a reduction of approximately 13.6% from the Baseline Design, for a total of 39,480 MWh/yr.

The main energy savings result from the use of pressure exchangers instead of Pelton wheels for energy recovery. The pressure exchangers are projected to yield 1,776 hp (1.3 aMW)[12] of power savings, which is 4% reduction of the total power use of 32.8 aMW. Converted into unit power savings, the energy reduction of 1.3 aMW corresponds to 0.6 kWh/kgal[13] (207 kWh/AF)[14]. The installation of premium-efficiency motors and VFDs on large pumps would result in additional 1.3 aMW (4.0%) of power savings.

The power savings of 0.6 kWh/kgal associated with the use of pressure exchangers instead of Pelton wheels for energy recovery are substantiated by information from several full-scale desalination plants which have recently replaced their existing Pelton wheel energy recovery systems with pressure exchangers in order to take advantage of the energy savings offered by this technology. Poseidon's submission of the Carlsbad Plan to the CCC included documentation entitled "Energy Recovery in Caribbean Seawater", which contains energy data for a seawater desalination plant in Mazarron, Spain where a Pelton wheel system was replaced with PX pressure exchangers. The replacement resulted in energy reduction from 3.1 kWh/m^3 to 2.4 kWh/m^3 (i.e., 0.7 kWh/m^3 or 2.6 kWh/kgal).

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[10] 28.76 MWh x 1,000 kW/MW/2083 kgal/Hr.
[11] 13.81 kWh/kgal x 326 kgal/AF.
[12] 1776 HP x 0.746 kW/HP
[13] 1.3 x 1000 kW/MW/2083kgal/Hr
[14] 0.64 kWh/kgal x 326 kgal/AF

Stand Alone Primary Route Option

Table 5 - Comparison of Baseline and High Efficiency Electric Budget for 50 MGD Water Production - Stand Alone Primary Route Option

	Baseline Design - Power Use			High Efficiency Design - Power Use		
Unit	(Hp)	Equip. Effic.	Equipment Type	(Hp)	Equip. Effic.	Equipment Type
Key Treatment Process Pumps						
Power Plant Intake Pumps (Collocated Operation)	1,210	70%	Standard Motors - No VFDs	1,210	70%	Standard Motors - No VFDs
Seawater Intake Pumps	1,650	70%	Standard Motors - No VFDs	1,445	80%	High Eff. Motors - VFDs
Filter Effluent Transfer Pumps	4,450	82%	High Eff. Motors - with VFDs	4,525	82%	High Eff. Motors - with VFDs
High Pressure Reverse Osmosis Pumps	38,806	82%	High Eff. Motors - No VFDs	36,160	88%	High Eff. Motors - No VFDs
Energy Recovery System – Power Reduction	-9,740	-25.10%	Pelton Wheels	-11,610	-32.10%	Pressure Exchangers
On-site Product Water Transfer Pumps (50 MGD)	5,538	70%	Standard Motors - No VFDs	4,500	80%	High Eff. Motors - No VFDs
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Scavenger Tank Mixing System	2	70%	Standard Motors - No VFDs	2	70%	Standard Motors - No VFDs
Flush Pumps	17	70%	Standard Motors - No VFDs	17	70%	Standard Motors - No VFDs
Cleaning Chemical System	15	70%	Standard Motors - No VFDs	15	70%	Standard Motors - No VFDs
Sewer System Transfer Pumps	15	65%	Standard Motors - No VFDs	15	65%	Standard Motors - No VFDs
Chemical Feed Equipment						
Polymer Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Ammonia Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Calcite Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Carbon Dioxide Feed System	1	65%	Standard Motors - No VFDs	1	65%	Standard Motors - No VFDs
Sodium Hypochlorite Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Other Chemical Feed Systems	3	65%	Standard Motors - No VFDs	3	65%	Standard Motors - No VFDs
Service Facilities						
HVAC	70	NA	Standard Equipment	70	NA	Standard Equipment
Lightning	400	NA	Standard Equipment	400	NA	Standard Equipment
Controls and Automation	10	NA	Standard Equipment	10	NA	Standard Equipment
Air Compressors	10	NA	Standard Equipment	10	NA	Standard Equipment
Other Miscellaneous Power Uses	200	NA	Standard Equipment	200	NA	Standard Equipment
TOTAL DESALINATION PLANT HORSEPOWER USE	**46,929**	**Hp**		**40,668**	**Hp**	
TOTAL DESALINATION PLANT POWER USE	**35.01**	**aMW**		**30.34**	**aMW**	

Table 5 presents a detailed breakdown of the projected power use of the Stand Alone Primary Route option project under a Baseline Design and High-Energy Efficiency Design. As indicated in this table, the Baseline Design includes high efficiency motors for all pumps, except the largest reverse osmosis feed pumps, and a Pelton wheel energy recovery system which is the most widely used "standard' energy recovery system today. The total desalination power use under the Baseline Design is 35.0 aMW, which corresponds to a unit power use of 16.8 kWh/kgal[15] (5,479 kWh/AF)[16].

In addition to the state-of-the-art pressure exchanger system described above, the High-Energy Efficiency Design incorporates premium efficiency motors and variable frequency drives (VFDs) on desalination plant pumps that have motors of 500 horsepower or more. The total desalination plant energy use under the High-Energy Efficiency Design is 30.3 aMW, which corresponds to

[15] 35.0 MWh x 1,000 kW/MW/Average Fresh Water Production Rate of 2083 kg/Hr.

[16] 16.8 kWh/kgal x 326 kgal/AF.

unit power use of 14.6 kWh/kgal[17] (4,748 kWh/AF)[18]. This is a reduction of approximately 13.3% from the Baseline Design, for a total of 40,917 MWh/yr.

The main energy savings result from the use of pressure exchangers instead of Pelton wheels for energy recovery. The pressure exchangers are projected to yield 1,870 hp (1.4 aMW)[19] of power savings, which is 4% reduction of the total power use of 35.0 aMW. Converted into unit power savings, the energy reduction of 1.4 aMW corresponds to 0.7 kWh/kgal[20] (218 kWh/AF)[21]. The installation of premium-efficiency motors and VFDs on large pumps would result in additional 1.3 aMW (4.0%) of power savings.

The power savings of 0.7 kWh/kgal associated with the use of pressure exchangers instead of Pelton wheels for energy recovery are substantiated by information from several full-scale desalination plants which have recently replaced their existing Pelton wheel energy recovery systems with pressure exchangers in order to take advantage of the energy savings offered by this technology. Poseidon's submission of the Carlsbad Plan to the CCC included documentation entitled "Energy Recovery in Caribbean Seawater", which contains energy data for a seawater desalination plant in Mazarron, Spain where a Pelton wheel system was replaced with PX pressure exchangers. The replacement resulted in energy reduction from 3.1 kWh/m^3 to 2.4 kWh/m^3 (i.e., 0.7 kWh/m^3 or 2.6 kWh/kgal).

[17] 30.3 MWh x 1,000 kW/MW/2083 kgal/Hr.
[18] 14.6 kWh/kgal x 326 kgal/AF.
[19] 1870 HP x 0.746 kW/HP
[20] 1.4 x 1000 kW/MW/2083kgal/Hr
[21] 0.67 kWh/kgal x 326 kgal/AF

Colocated Optional Route Option

Table 6 - Comparison of Baseline and High Efficiency Electric Budget for 50 MGD Water Production Capacity - Colocated Optional Route Option

Unit	Baseline Design - Power Use			High Efficiency Design - Power Use		
	(Hp)	Equip. Effic.	Equipment Type	(Hp)	Equip. Effic.	Equipment Type
Key Treatment Process Pumps						
Power Plant Intake Pumps (Collocated Operation)	0	NA	NA	0	NA	NA
Seawater Intake Pumps	1,650	70%	Standard Motors - No VFDs	1,445	80%	High Eff. Motors - VFDs
Filter Effluent Transfer Pumps	4,450	82%	High Eff. Motors - with VFDs	4,525	82%	High Eff. Motors - with VFDs
High Pressure Reverse Osmosis Pumps	36,960	82%	High Eff. Motors - No VFDs	34,440	88%	High Eff. Motors - No VFDs
Energy Recovery System – Power Reduction	-9,280	-25.10%	Pelton Wheels	-11,056	-32.10%	Pressure Exchangers
On-site Product Water Transfer Pumps (50 MGD)	4,615	70%	Standard Motors - No VFDs	3,750	80%	High Eff. Motors - No VFDs
Off-site Product Water Pump Station (50 MGD)	5,846	65%	Standard Motors – No VFDs	4,750	80%	High Eff. Motors with VFDs
Pretreatment Filter & Residuals Handling Equipment						
Residuals Transfer Pumps	150	65%	Standard Motors - No VFDs	150	65%	Standard Motors - No VFDs
Residuals Dewatering System	600	70%	Standard Motors - No VFDs	600	70%	Standard Motors - No VFDs
Filter Backwash Blowers	250	70%	Standard Motors - No VFDs	250	70%	Standard Motors - No VFDs
Filter Backwash Pumps	150	70%	Standard Motors - No VFDs	150	70%	Standard Motors - No VFDs
Flocculation Mixers	30	70%	Standard Motors - No VFDs	30	70%	Standard Motors - No VFDs
RO Membrane Cleaning System						
Membrane Cleaning Pumps	13	70%	Standard Motors - No VFDs	13	70%	Standard Motors - No VFDs
Scavenger Tank Mixing System	2	70%	Standard Motors - No VFDs	2	70%	Standard Motors - No VFDs
Flush Pumps	17	70%	Standard Motors - No VFDs	17	70%	Standard Motors - No VFDs
Cleaning Chemical System	15	70%	Standard Motors - No VFDs	15	70%	Standard Motors - No VFDs
Sewer System Transfer Pumps	15	65%	Standard Motors - No VFDs	15	65%	Standard Motors - No VFDs
Chemical Feed Equipment						
Polymer Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Ammonia Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Calcite Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Carbon Dioxide Feed System	1	65%	Standard Motors - No VFDs	1	65%	Standard Motors - No VFDs
Sodium Hypochlorite Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Other Chemical Feed Systems	3	65%	Standard Motors - No VFDs	3	65%	Standard Motors - No VFDs
Service Facilities						
HVAC	70	NA	Standard Equipment	70	NA	Standard Equipment
Lightning	400	NA	Standard Equipment	400	NA	Standard Equipment
Controls and Automation	10	NA	Standard Equipment	10	NA	Standard Equipment
Air Compressors	10	NA	Standard Equipment	10	NA	Standard Equipment
Other Miscellaneous Power Uses	200	NA	Standard Equipment	200	NA	Standard Equipment
TOTAL DESALINATION PLANT HORSEPOWER USE	**46,179**	**Hp**		**39,792**	**Hp**	
TOTAL DESALINATION PLANT POWER USE	**34.45**	**aMW**		**29.68**	**aMW**	

Table 6 presents a detailed breakdown of the projected power use of the Colocated Optional Route option project under a Baseline Design and High-Energy Efficiency Design. As indicated in this table, the Baseline Design includes high efficiency motors for all pumps, except the largest reverse osmosis feed pumps, and a Pelton wheel energy recovery system which is the most widely used "standard' energy recovery system today. The total desalination power use under the Baseline Design is 34.4 aMW, which corresponds to a unit power use of 16.5 kWh/kgal[22] (5,392 kWh/AF)[23].

In addition to the state-of-the-art pressure exchanger system described above, the High-Energy Efficiency Design incorporates premium efficiency motors and variable frequency drives (VFDs) on desalination plant pumps that have motors of 500 horsepower or more. The total desalination plant energy use under the High-Energy Efficiency Design is 29.7 aMW, which corresponds to

[22] 34.4 MWh x 1,000 kW/MW/Average Fresh Water Production Rate of 2083 kg/Hr.

[23] 16.5 kWh/kgal x 326 kgal/AF.

unit power use of 14.3 kWh/kgal[24] (4,646 kWh/AF)[25]. This is a reduction of approximately 13.8% from the Baseline Design, for a total of 41,741 MWh/yr

The main energy savings result from the use of pressure exchangers instead of Pelton wheels for energy recovery. The pressure exchangers are projected to yield 1,776 hp (1.3 aMW)[26] of power savings, which is 3.8% reduction of the total power use of 34.4 aMW. Converted into unit power savings, the energy reduction of 1.3 aMW corresponds to 0.6 kWh/kgal[27] (207 kWh/AF)[28]. The installation of premium-efficiency motors and VFDs on large pumps would result in additional 1.3 aMW (3.8%) of power savings.

The power savings of 0.6 kWh/kgal associated with the use of pressure exchangers instead of Pelton wheels for energy recovery are substantiated by information from several full-scale desalination plants which have recently replaced their existing Pelton wheel energy recovery systems with pressure exchangers in order to take advantage of the energy savings offered by this technology. Poseidon's submission of the Carlsbad Plan to the CCC included documentation entitled "Energy Recovery in Caribbean Seawater", which contains energy data for a seawater desalination plant in Mazarron, Spain where a Pelton wheel system was replaced with PX pressure exchangers. The replacement resulted in energy reduction from 3.1 kWh/m^3 to 2.4 kWh/m^3 (i.e., 0.7 kWh/m^3 or 2.6 kWh/kgal).

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[24] 29.7 MWh x 1,000 kW/MW/2083 kgal/Hr.
[25] 14.3 kWh/kgal x 326 kgal/AF.
[26] 1776 HP x 0.746 kW/HP
[27] 1.3 x 1000 kW/MW/2083kgal/Hr
[28] 0.64 kWh/kgal x 326 kgal/AF

Stand Alone Optional Route Option

Table 7 - Comparison of Baseline and High Efficiency Electric Budget for 50 MGD Water Production Capacity - Stand Alone Optional Route

	Baseline Design - Power Use			High Efficiency Design - Power Use		
Unit	(Hp)	Equip. Effic.	Equipment Type	(Hp)	Equip. Effic.	Equipment Type
Key Treatment Process Pumps						
Power Plant Intake Pumps (Collocated Operation)	1,210	70%	Standard Motors - No VFDs	1,210	70%	Standard Motors - No VFDs
Seawater Intake Pumps	1,650	70%	Standard Motors - No VFDs	1,445	80%	High Eff. Motors - VFDs
Filter Effluent Transfer Pumps	4,450	82%	High Eff. Motors - with VFDs	4,525	82%	High Eff. Motors - with VFDs
High Pressure Reverse Osmosis Pumps	38,806	82%	High Eff. Motors - No VFDs	36,160	88%	High Eff. Motors - No VFDs
Energy Recovery System – Power Reduction	-9,740	-25.10%	Pelton Wheels	-11,610	-32.10%	Pressure Exchangers
On-site Product Water Transfer Pumps (50 MGD)	4,615	70%	Standard Motors - No VFDs	3,750	80%	High Eff. Motors - No VFDs
Off-site Product Water Pump Station (50 MGD)	5,846	65%	Standard Motors – No VFDs	4,750	80%	High Eff. Motors with VFDs
Pretreatment Filter & Residuals Handling Equipment						
Residuals Transfer Pumps	150	65%	Standard Motors - No VFDs	150	65%	Standard Motors - No VFDs
Residuals Dewatering System	600	70%	Standard Motors - No VFDs	600	70%	Standard Motors - No VFDs
Filter Backwash Blowers	250	70%	Standard Motors - No VFDs	250	70%	Standard Motors - No VFDs
Filter Backwash Pumps	150	70%	Standard Motors - No VFDs	150	70%	Standard Motors - No VFDs
Flocculation Mixers	30	70%	Standard Motors - No VFDs	30	70%	Standard Motors - No VFDs
RO Membrane Cleaning System						
Membrane Cleaning Pumps	13	70%	Standard Motors - No VFDs	13	70%	Standard Motors - No VFDs
Scavenger Tank Mixing System	2	70%	Standard Motors - No VFDs	2	70%	Standard Motors - No VFDs
Flush Pumps	17	70%	Standard Motors - No VFDs	17	70%	Standard Motors - No VFDs
Cleaning Chemical System	15	70%	Standard Motors - No VFDs	15	70%	Standard Motors - No VFDs
Sewer System Transfer Pumps	15	65%	Standard Motors - No VFDs	15	65%	Standard Motors - No VFDs
Chemical Feed Equipment						
Polymer Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Ammonia Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Calcite Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Carbon Dioxide Feed System	1	65%	Standard Motors - No VFDs	1	65%	Standard Motors - No VFDs
Sodium Hypochlorite Feed System	0.5	65%	Standard Motors - No VFDs	0.5	65%	Standard Motors - No VFDs
Other Chemical Feed Systems	3	65%	Standard Motors - No VFDs	3	65%	Standard Motors - No VFDs
Service Facilities						
HVAC	70	NA	Standard Equipment	70	NA	Standard Equipment
Lightning	400	NA	Standard Equipment	400	NA	Standard Equipment
Controls and Automation	10	NA	Standard Equipment	10	NA	Standard Equipment
Air Compressors	10	NA	Standard Equipment	10	NA	Standard Equipment
Other Miscellaneous Power Uses	200	NA	Standard Equipment	200	NA	Standard Equipment
TOTAL DESALINATION PLANT HORSEPOWER USE	**48,775**	**Hp**		**42,168**	**Hp**	
TOTAL DESALINATION PLANT POWER USE	**36.39**	**aMW**		**31.46**	**aMW**	

Table 7 presents a detailed breakdown of the projected power use of the Stand Alone Optional Route option project under a Baseline Design and High-Energy Efficiency Design. As indicated in this table, the Baseline Design includes high efficiency motors for all pumps, except the largest reverse osmosis feed pumps, and a Pelton wheel energy recovery system which is the most widely used "standard' energy recovery system today. The total desalination power use under the Baseline Design is 36.39 aMW, which corresponds to a unit power use of 17.5 kWh/kgal[29] (5,695 kWh/AF)[30].

In addition to the state-of-the-art pressure exchanger system described above, the High-Energy Efficiency Design incorporates premium efficiency motors and variable frequency drives (VFDs) on desalination plant pumps that have motors of 500 horsepower or more. The total desalination plant energy use under the High-Energy Efficiency Design is 31.5 aMW, which corresponds to

[29] 36.4 MWh x 1,000 kW/MW/Average Fresh Water Production Rate of 2083 kg/Hr.

[30] 17.5 kWh/kgal x 326 kgal/AF.

unit power use of 15.1 kWh/kgal[31] (4,923 kWh/AF)[32]. This is a reduction of approximately 13.5% from the Baseline Design, for a total of 43,178 MWh/yr.

The main energy savings result from the use of pressure exchangers instead of Pelton wheels for energy recovery. The pressure exchangers are projected to yield 1,870 hp (1.4 aMW)[33] of power savings, which is 3.8% reduction of the total power use of 36.4 aMW. Converted into unit power savings, the energy reduction of 1.4 aMW corresponds to 0.7 kWh/kgal[34] (218 kWh/AF)[35]. The installation of premium-efficiency motors and VFDs on large pumps would result in additional 1.3 aMW (3.8%) of power savings.

The power savings of 0.7 kWh/kgal associated with the use of pressure exchangers instead of Pelton wheels for energy recovery are substantiated by information from several full-scale desalination plants which have recently replaced their existing Pelton wheel energy recovery systems with pressure exchangers in order to take advantage of the energy savings offered by this technology. Poseidon's submission of the Carlsbad Plan to the CCC included documentation entitled "Energy Recovery in Caribbean Seawater", which contains energy data for a seawater desalination plant in Mazarron, Spain where a Pelton wheel system was replaced with PX pressure exchangers. The replacement resulted in energy reduction from 3.1 kWh/m^3 to 2.4 kWh/m^3 (i.e., 0.7 kWh/m^3 or 2.6 kWh/kgal).

B. GHG Emission Reduction by Green Building Design.

The Project will be located on a site currently occupied by an oil storage tank no longer used by the power plant. This tank and its content will be removed and the site will be reused to construct the Project. Because the facility is an industrial facility, LEED-level certification will not be feasible; but to the extent reasonably practicable, building design will follow the principles of the Leadership in Energy and Environmental Design (LEED) program. LEED is a program of the United States Green Building Council, developed to promote construction of sustainable buildings that reduce the overall impact of building construction and functions on the environment by: (1) sustainable site selection and development, including re-use of existing industrial infrastructure locations; (2) energy efficiency; (3) materials selection; (4) indoor environmental quality, and (5) water savings.

The potential energy savings associated with the implementation of the green building design as compared to that for a standard building design are in a range of 300 MWh/yr to 500 MWh/yr. The potential carbon footprint reduction associated with this design is between 86 and 143 tons of CO_2 per year. The energy savings associated with incorporating green building design features into the desalination plant structures (i.e., natural lighting, high performance fluorescent lamps, high-efficiency HVAC and compressors, etc.) are based on the assumption that such

[31] 31.4 MWh x 1,000 kW/MW/2083 kgal/Hr.
[32] 15.1 kWh/kgal x 326 kgal/AF.
[33] 1870 HP x 0.746 kW/HP
[34] 1.4 x 1000 kW/MW/2083kgal/Hr
[35] 0.67 kWh/kgal x 326 kgal/AF

features will reduce the total energy consumption of the plant service facilities by 6 to 10 %. As indicated in Tables 4 through 7, the plant service facilities (HVAC, lighting, controls and automation, air compressors and other miscellaneous power uses) are projected to have power use of 690 hp (70 hp + 400 hp + 10 hp + 10 hp + 200 hp = 690 hp) when standard equipment is used. The total annual energy demand for these facilities is calculated as follows; 690 hp x 0.746 kW/hp x 0.001 kW/MW x 24 hrs x 365 days = 4,509 MWh/yr. If use of green building design features result in 6 % of energy savings, the total annual power use reduction of the service facilities is calculated at 0.06 x 4,509 MWh/yr = 270.5 MWh/yr (rounded to 270 MWh/yr). Similarly, energy savings of 10 % due to green building type equipment would yield 0.1 x 4,509 MWh/yr = 450.9 MWh/yr (rounded to 450 MWh/yr) of savings. The total actual energy reduction resulting from the use of the green building design will be determined by direct readings of the total electricity consumed by the desalination plant at the Project's substation(s) electric meter(s) and documented when the Project is fully operational.

C. **On-Site Solar Power Generation**.

Poseidon is exploring the installation of rooftop photovoltaic (PV) system for solar power generation as one element of its green building design. Brummitt Energy Associates of San Diego completed a feasibility study in March 2007 of a photovoltaic system for the Carlsbad Desalination Plant. If a similar solar installation described by Brummitt is implemented in Huntington Beach, the desalination plant buildings would accommodate solar panels on a roof surface of approximately 39,000 square feet, with the potential to generate approximately 606 MWh/yr of electricity. If installed, the electricity produced by the onsite PV system would be used by the Project and therefore would reduce the Project's electrical demand on SCE. The corresponding reduction of the Project's indirect emissions would be 173 tons of CO_2 per year. Poseidon is exploring other solar proposals and will update this information as it becomes available. Ultimately, the electricity and corresponding GHG savings of any on-site solar installation will be documented in the Project's annual electricity usage information. Poseidon will use commercially reasonable efforts to implement an on-site solar power project if it is reasonably expected to provide a return on the capital investment over the life of the Project.

If Poseidon proceeds with an onsite PV system, the total actual energy reductions resulting from the use of on-site solar power generation will be determined by direct readings of the total electricity consumed by the desalination plant at the Project's substation(s) electric meter(s) and documented once the system is fully operational.

D. **Recovery of CO_2**.

Approximately 2,100 tons of CO_2 per year are planned to be used at the Project for post-treatment of the product water (permeate) produced by the reverse osmosis (RO) system. Carbon dioxide in a gaseous form will be added to the RO permeate in combination with calcium hydroxide or calcium carbonate in order to form soluble calcium bicarbonate which adds hardness and alkalinity to the drinking water for distribution system corrosion protection. In this post-treatment process of RO permeate stabilization, gaseous carbon dioxide is sequestered in soluble form as calcium bicarbonate. Because the pH of the drinking water distributed for potable use is in a range (8.3 to 8.5) at which CO_2 is in a soluble bicarbonate form, the carbon dioxide introduced in the RO permeate would remain permanently sequestered. During the treatment process the calcium carbonate (calcite – $CaCO_3$) reacts with the carbon dioxide injected in the water and forms completely soluble calcium bicarbonate as follows:

$$CaCO_{3\ (solid)} + CO_{2\ (gas)} + H_2O_{\ (liquid)} \rightarrow Ca(HCO_3)_{2\ (liquid\ solution)}$$

At the typical pH range of drinking water (pH of 8.3 to 8.5) the carbon dioxide will remain in the drinking water in soluble form (see Figure 4) and the entire amount (100 %) of the injected carbon dioxide will be completely dissolved.

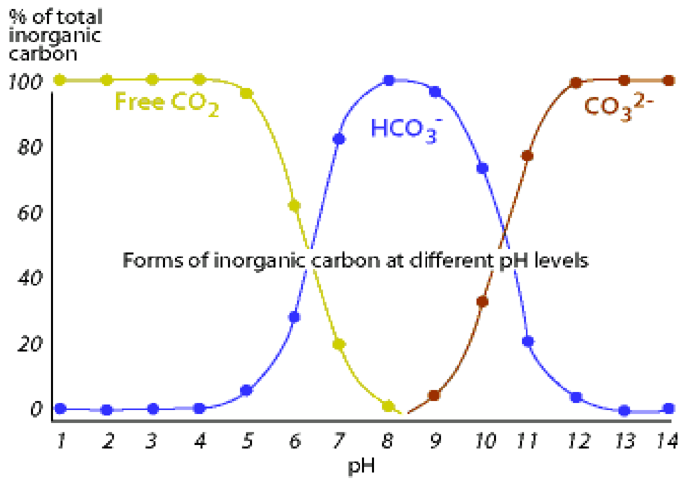

Figure 4 – Relationship between free carbon dioxide in gaseous form and pH
(Source: http://www.cotf.edu/ete/modules/waterq3/WQassess3b.html)[36]

A small quantity of carbon dioxide used in the desalination plant post-treatment process is sequestered directly from the air when the pH of the source seawater is adjusted by addition of

[36] This chemical reaction and information presented on Figure 4 are well known from basic chemistry of water. *See* American Water Works Association (AWWA) (2007) Manual of Water Supply Practices, M46, Reverse Osmosis and Nanofiltration, Second Edition;
http://www.chem1.com/CQ/hardwater.html; http://www.cotf.edu/ete/modules/waterq3/WQassess3b.html. Once the desalinated drinking water is delivered to individual households, only a small portion of this water will be ingested directly or with food. Most of the delivered water will be used for other purposes – personal hygiene, irrigation, etc. The calcium bicarbonate ingested by humans will be dissociated into calcium and bicarbonate ions. The bicarbonate ions will be removed by the human body through the urine
(http://www.chemistry.wustl.edu/~courses/genchem/Tutorials/Buffers/carbonic.htm). Since the CO_2 is sequestered into the bicarbonate ion, human consumption of the desalinated water will not result in release of CO_2. The bicarbonate in the urine will be conveyed along with the other sanitary sewerage to the wastewater treatment plant. Since the bicarbonate is dissolved, it will not be significantly impacted by the wastewater treatment process and ultimately will be discharged to the ocean with the wastewater treatment plant effluent. The ocean water pH is in a range of 7.8 to 8.3, which would be adequate to maintain the originally sequestered CO_2 in a soluble form – see Figure 4 above. Other household uses of drinking water, such as personal hygiene, do not involve change in drinking water pH as demonstrated by the fact that pH of domestic wastewater does not differ significantly from that of the drinking water. A portion of the household drinking water would likely be used for irrigation. A significant amount of the calcium bicarbonate in the
irrigation water would be absorbed and sequestered in the plant roots (http://www.pubmedcentral.nih.gov/pagerender.fcgi?artid=540973&pageindex=1). The remaining portion of calcium bicarbonate would be adsorbed in the soils and/or would enter the underlying groundwater aquifer.

sulfuric acid in order to prevent RO membrane scaling. A larger amount of CO_2 would be delivered to the Project site by commercial supplier for addition to the permeate. Depending on the supplier, carbon dioxide is of one of two origins: (1) a CO_2 Generating Plant or (2) a CO_2 Recovery Plant. CO_2 generating plants use various fossil fuels (natural gas, kerosene, diesel oil, etc.) to produce this gas by fuel combustion. CO_2 recovery plants produce carbon dioxide by recovering it from the waste streams of other industrial production facilities which emit CO_2-rich gasses: breweries, commercial alcohol (i.e., ethanol) plants, hydrogen and ammonia plants, etc. Typically, if these gases are not collected via CO_2 recovery plant and used in other facilities, such as the desalination plant, they are emitted to the atmosphere and therefore, constitute a GHG release.

To the extent that it is reasonably available, Poseidon intends to acquire the carbon dioxide from a recovery operation. Use of recovered CO_2 at the Project would sequester 1,144 tons of CO_2 per year in the Project product water. The total annual use of carbon dioxide (i.e., 1,144 tons/CO_2 per year) in the water treatment process was determined based on the daily carbon dioxide consumption presented in Table 4.8-1 of Section 4.8 "Hazards and Hazardous Materials" of the Draft Huntington Beach desalination project Subsequent Environmental Impact Report (EIR). The annual consumption of CO_2 in this table is 2,522,000 lbs of CO_2 per year, or 1,144 tons of CO_2 per year (2,522,000 lbs/2,204.5 lbs/ton=1,144 tons).. The daily amount of carbon dioxide in Table 5.8-1 of the EIR was calculated based on the dosage needed to provide adequate hardness (concentration of calcium bicarbonate) in the seawater to protect the water distribution system from corrosion. This amount was determined based on pilot testing of distribution system piping and household plumbing at the Carlsbad seawater desalination demonstration project. The testing was completed using the same type of calcium carbonate chips as those planned to be used in the full-scale operations. Every load of carbon dioxide delivered to the desalination plant site will be accompanied by a certificate that states the quantity, quality and origin of the carbon dioxide and indicates that this carbon dioxide was recovered as a site product from an industrial application of known type of production (i.e., brewery, ethanol plant, etc.), and that it was purified to meet the requirements associated with its use in drinking water applications (i.e., the chemical is NSF approved). The plant operations manager will receive and archive the certificates for verification purposes. At the end of the year, the operations manager will provide copies of all certificates of delivered carbon dioxide to the independent third party reviewer (currently the California Center for Sustainable Energy) responsible for verification facility compliance with the Energy Minimization and Greenhouse Gas Reduction Plan.

As noted, verification would be provided through certificates of origin received from suppliers of CO_2 delivered to the Project site indicating the actual amount of CO_2 delivered to the site, date of delivery, origin of the CO_2, and the purity of this gas. Poseidon will place conditions in its purchase agreements with CO_2 vendors that require transfer of CO_2 credits to Poseidon and otherwise ensure that the CO_2 is not accounted for through any other carbon reduction program so as to avoid "double counting" of associated carbon credits.

E. <u>Avoided Emissions from Displaced Imported Water</u>.

Another source of Avoided Emissions will result from the Project's introduction of a new, local source of water into Orange County; water that will displace imported water now delivered to

Customers from the State Water Project (SWP) – a system with its own significant energy load and related carbon emissions.

One of the primary reasons for the development of the Project is to replace imported water with a locally produced alternative drought-proof source of water supply. Currently, Orange County imports over 50% of its water from two sources – the SWP and the Colorado River. These imported water delivery systems consist of a complex system of intakes, dams, reservoirs, aqueducts and pump stations, and water treatment facilities.

In April 2010, the Municipal Water District of Orange County (MWDOC) commissioned a study (Appendix W of the Project's Subsequent Environmental Impact Report) entitled *"Orange County Water Resources Mix and Implications for Desalinated Water Offsets of Imported Water Supplies."*

The Report provides an analysis of the impacts of the delivery of desalinated water supplies from the Project and assesses whether the introduction of Project water into the Orange County's water supply portfolio will result in a net reduction in the demand for imported State Water Project supplies from the Metropolitan Water District of Southern California (Metropolitan). Based on this analysis, the Report reached the following conclusions:

- Consistent with the Metropolitan Board adopted Laguna Declaration of 1952, Metropolitan is the supplemental water supplier to Orange County and is prepared to provide its service area with adequate supplies of water to meet projected demand.

- Given the high costs and challenges associated with the delivery of water supplies that must pass through San Francisco Bay/Sacramento-San Joaquin River Delta (Bay-Delta), State Water Project (SWP) supplies will remain as supplemental supplies for Metropolitan. Thus, any new local supply development that reduces the demand for imported supplies will result in a net reduction in SWP supplies or other supplies from northern California.

- Metropolitan's provides financial incentives of up to $250/AF of water produced for qualifying desalination projects in its service area. To qualify for the incentive, proposed projects must replace an existing demand or prevent a new demand on Metropolitan's imported water supplies.

- To date, there is only one project, with a capacity of 56TAF, within the Metropolitan service area that is currently under construction, which represents just 37% of the 150TAF desalination goal discussed Metropolitan's 2004 Integrated Water Resources Plan (IRP) Update.

- This analysis illustrates that the Project would result in a total net reduction in Metropolitan imported water deliveries of 56,000 AF per year to the Orange County water agencies that purchase water from the Project (Participating Agencies), consistent with the GHG Plan.

- Historical demands for Participating Agencies between FY 1989-1990 and FY 2008-2009 illustrate that these agencies have consistently purchased a minimum of 185,066 AF per year of Metropolitan imported water.

- Historical demands for imported water supplies by the Participating agencies between FY 1989 and FY 2008-2009 exceed potential Project water purchases in all years.

- Projected future demands for imported water supplies by the Participating Agencies total at least 198,119 AF per year, which would be reduced to 142,119 AF per year with Project water purchases.

- Projected demands for each participating agency between 2015 and 2035 illustrate that the projected imported water purchases for each agency exceeds its potential Project water purchase amount in all years.

- Despite significant population growth within Orange County since FY 1989-1990, historical water use has remained relatively consistent due to water conservation. Given the ongoing water conservation efforts and the 20% reduction in urban water use by 2020 mandated under SB x7, it is expected that imported water demand will not increase through 2035. Consequently, imported water from the SWP that is replaced by the Project's water is not expected to be imported into Orange County to satisfy water demand from new or expanded uses developed to accommodate population growth.

As discussed in the Report, the 2003 multi-state Colorado River quantitative settlement agreement forced Metropolitan Water District of Southern California (MWD) to reduce its pumping from the Colorado River by 53% -- from 1.2 MAFY to 0.6 MAFY. As a result, MWD now operates its imported water delivery system to base load its Colorado River allotment and draw from the SWP only as needed to serve demand that cannot be met by the lower cost water available from the Colorado River Aqueduct. Thus new local supply development that reduces the demand for imported supplies will result in a reduction in SWP supplies or other supplies from the Bay-Delta region. It is anticipated that applications will be submitted to Metropolitan's Seawater Desalination Program to make the Project's water eligible for the Program's financial incentives.

The proposed Project will supply 56,000 acre-feet of water per year to Orange County. The Project will provide direct, one-to-one replacement of imported water to meet the requirements of the participating water agencies, thus eliminating the need to pump 56,000 acre feet of water into the region to serve those agencies' demand. Consequently, the proposed Project will reduce the MWD's demand on the SWP to serve the participating water agencies.

The total amount of electricity needed to provide treated water to Poseidon's public agency partners via the SWP facilities is shown in Table 8 below. The net power requirement to pump an acre-foot of water through the East Branch of the SWP into Orange County is 3,036 KWh (source: MWD). Approximately 2% of the SWP water pumped to Southern California is lost to evaporation from Department of Water Resources' reservoirs located south of the Tehachapi Mountains (source: MWD). The evaporation loss results in a net increase of 68 KWh per acre-foot of SWP water actually delivered to Southern California homes and businesses. Finally, prior to use, the SWP water must be treated to meet Safe Drinking Water Act requirements. The MWD Diemer Water Treatment Plant consumes about 30 KWh/AF of water treated (source: MWD).

Table 8 - State Water Project Supply Energy Use

Energy Demand	KWh/AF	Source
Pumping Through East Branch	3,036	MWD
Evaporation Loss	68	MWD
Diemer Water Treatment Plant	30	MWD
Total	**3,134**	

The reduction of demand for imported water is critical to Southern California's water supply reliability, so much so that MWD not only supports the Project, but has also established a program that could provide $14 million annually to reduce the cost to Poseidon's customers. Under MWD's program, water agencies are eligible for $250 for every acre-foot of desalinated water purchased from the Huntington Beach facility, *so long as the desalinated water offsets an equivalent amount of imported water.* MWD has established "Seawater Desalination Policy Principles and Administrative Guidelines" that require recordkeeping, annual data submittals, and MWD audit rights to ensure that MWD water is offset. These requirements would be memorialized in a binding agreement between MWD and the Project's water agency customers.

The benefits of a reduction in demand on MWD's system are reflected in, among other things, the energy savings resulting from the pumping of water that – but for the Project – would have to continue. For every acre-foot of SWP water that is replaced by water from the proposed Project, 3.13 MWh of electricity use to deliver water to Customers is avoided, along with associated carbon emissions. And since the High-Energy Efficiency Design Project requires 5.2 to 5.7 MWh of electricity to produce one acre-foot of water, the net electricity required to deliver water from the Project to Customers is 2.1 to 2.6 MWh/AF.

Because the Project will avoid the use of 56,000 AFY of imported water to Orange County, once in operation, the Project will also avoid 175,500 MWh/yr of electricity consumption otherwise required to deliver that water to Orange County, as well as the GHG emissions associated with pumping, treatment and distribution of this imported water. At 605.36 lbs CO_2 per MWh, the total expected Avoided Emissions as a result of the Project is 48,190 metric tons CO_2/yr. Each year, Poseidon will be credited with Avoided Emissions based on the most recent SWP emissions factors and the amount of water Poseidon produces. [37]

Table 9 summarizes the expected Project and project-related reductions of GHG Emissions.

[37] California Department of Water Resources published a 2007 Annual Emissions Report with the CCAR in May 2009 for the SWP.

Table 9 – Expected Project and Project-Related Reduction of GHG Emissions

Source	Total Annual Reductions in Power Use (MWh/year saved)	Total Annual Emissions Avoided (metric tons CO_2/ year avoided)
Reduction due to High-Efficiency Design	(39,500 to 43,200)	(11,300 to 12,360)
Green Building Design	(300 to 500)	(86 to 143)
On-site Solar Power Generation	(0-606)	(0-173)
Recovery of CO_2	(NA)	(1,144)
Reduced Water Importation	(175,500)	(48,190)
Subtotal On-site Reduction Measures	(215,300 to 219,806)	**(60,720 to 62,010)**

PART III: IDENTIFICATION OF MITIGATION OPTIONS TO OFFSET ANY REMAINING GHG EMISSIONS

Offsite reductions of GHG emissions that are not inherently part of the Project include actions taken by Poseidon to participate in local, regional, state, national or international offset projects that result in the cost-effective reduction of GHG emissions equal to the indirect Project emissions Poseidon is not able to reduce through other measures.[38] Subject to the provisions of Sections III.C, E and F below, carbon offset projects, except for RECs will be purchased by Poseidon through/from CCAR, California APCDs / AQMDs, CARB or other providers of offsets approved by the City of Huntington Beach (collectively, "Third Party Providers").[39] The exact nature and cost of the offset projects and RECs will not be known until they are acquired by Poseidon. Offsets or RECs will also be used as the swing mitigation option to "true-up" changes over time to the Project's net indirect GHG emissions, as discussed below.

A. <u>Annual "True-Up" Process</u>

Since the quantity of offsets required will vary from year-to-year, the goal of the annual "True-Up" process is to enable Poseidon to meet the subject year's need for metric tons of offsets by purchasing or banking offsets in the short-term, while allowing Poseidon to make long-term purchases and bank offsets to decrease market exposure and administrative costs. To complete the True-Up process Poseidon will obtain the latest SCE emissions factor from the annual web-based CARB or CCAR Emissions Report within 60 days of the (i) end of each calendar year, or

[38] This Plan requires Poseidon to join CCAR's Climate Action Reserve, so that it may implement some of this Plan through the Reserve.

[39] Part 4, Section 38562(d)(1)&(2) states that CARB regulations covering GHG emission reductions from regulated "sources" must ensure that such reductions are "real, permanent, quantifiable, verifiable, . . . enforceable [and additional]". While the Project is not a "source" under AB 32 and the criteria are not currently defined under implementing regulations, Third Party Providers will evaluate potential offset projects against equivalent criteria using their own protocols that employ the same criteria.

(ii) the date of publication of the CARB or CCAR Emissions Report on the relevant CARB or CCAR web site, whichever is later. Within 120 days of the end of the prior calendar year or publication of the emissions factor (whichever is later), Poseidon will gather electricity usage data, relevant data regarding Avoided Emissions, and then calculate the necessary metric tons of offsets required for the subject year. The subject year's emissions will be calculated using actual billing data and the emissions factor for the relevant annual period. The subject year's calculated metric tons of net emissions will be compared to the amount of metric tons of offsets previously acquired by Poseidon to determine if Poseidon has a positive or negative balance of net GHG emissions for the subject year, and all of this information will be included in the Annual GHG Report to be submitted to the City each year as discussed below. If there is a positive balance of net GHG emissions, Poseidon will purchase offsets to eliminate the positive balance, and provide the City with documentation substantiating that purchase, within 120 days of the date the positive balance is identified in the Annual GHG Report. If there is a negative balance of net GHG emissions, the surplus offsets may be carried forward into subsequent years or sold by Poseidon on the open market. All documentation that Poseidon will submit to the City pursuant to this Section shall also be submitted to the SLC.]

Prior to the commencement of Project operations, Poseidon will be required to purchase offsets sufficient to cover estimated net (indirect) GHG emissions for at least the first year of operation (subject to City staff concurrence), or to cover a longer period of time at Poseidon's option, based on the most recently published SCE emissions factor from CARB or CCAR and estimated electricity usage data for the first year of the Project period for which offsets are initially purchased. Poseidon will have the option to purchase offsets for any longer period of time up to and including the entire 30 year life of the Project, subject to Poseidon's above-stated obligation to address any positive balance in net GHG emissions that may subsequently arise. Beginning with the Sixth Annual Report, Poseidon can meet its net GHG compliance obligations over a rolling five-year period. Poseidon will purchase enough GHG reductions measures that conform to the Plan such that it will never incur a positive net GHG emissions balance over any rolling five-year period.

B. <u>Carbon Offset Projects and Credits</u>

Subject to the provisions of Sections III.C, E and F below, Poseidon will purchase carbon offset projects, except for RECs, through/from CARB, CCAR, or California APCDs / AQMDs. An offset is created when a specific action is taken that reduces, avoids or sequesters greenhouse gas (GHG) emissions in exchange for a payment from an entity mitigating its GHG emissions. Examples of offset projects include, but are not limited to: increasing energy efficiency in buildings or industries, reducing transportation emissions, generating electricity from renewable resources such as solar or wind, modifying industrial processes so that they emit fewer GHGs, installing cogeneration, and reforestation or preserving forests.

One type of offset project is Renewable Energy Credits (RECs), also known as Green Tags, Renewable Energy Certificates or Tradable Renewable Certificates. Each REC represents proof that 1 MW of electricity was generated from renewable energy (wind, solar, or geothermal). For GHG offsetting purposes, purchasing a REC is the equivalent of purchasing 1 MW of electricity from a renewable energy source, effectively offsetting the GHGs otherwise associated with the production of that electricity. RECs may be sold separately from the electricity.

Except as specified below, offset projects that Poseidon implements pursuant to this Plan will be those approved by CARB, CCAR, or any California APCD / AQMD as conforming to AB 32 requirements. Poseidon is committed to acquiring cost-effective offsets that meet rigorous standards, as detailed in this Plan. By requiring adherence to the principles, practices and performance standards described here, the Plan is designed to assure that selected offset projects will mitigate GHG emissions as effectively as on-site or direct GHG reductions. Adherence will ensure that the offset projects acquired by Poseidon are real, permanent, quantifiable, verifiable, enforceable, and additional consistent with the principles of AB 32.

C. <u>Offset Acquisition and Verification</u>

Poseidon shall acquire offsets through/from CCAR, CARB or California APCD/AQMD-approved projects. Acquisitions of RECs are not limited to purchase from CCAR, CARB, or a California APCD/AQMD.

If sufficient offsets are not available from CCAR, CARB or a California APCD/AQMD at a price that is reasonably equivalent to the price for offsets in the broader domestic market, Poseidon may submit a written request to the City's Planning Director requesting that one or more additional offset providers, including without limitation any existing member of the Offset Quality Initiative, which includes CCAR, The Climate Trust, Environmental Resources Trust and The Climate Group/Voluntary Carbon Standard, be designated as a Third Party Provider from/through whom Poseidon may purchase offsets under the Plan.[40] In deciding whether or not to approve Poseidon's request, the City's Planning Director shall consider whether or not the proposed Third Party Provider is an independent and non-affiliated entity that adheres to substantially similar principles and evaluation criteria for high quality offsets as CCAR, CARB, a California APCD/AQMD or any Third Party Provider previously approved by the City's Planning Director or the City Council. The City's Planning Director shall determine whether or not to approve Poseidon's request to designate a Third Party Provider within 60 days. Any dispute between Poseidon and City's Planning Director regarding the approval or denial of the requested entity may be brought by Poseidon to the City Council for hearing and resolution at the next available hearing date.

Poseidon's Annual GHG Report, discussed in Section III.D below, shall include an accounting summary and documentation from CCAR, CARB, a California APCD/AQMD and Third Party Providers, as applicable, which verifies that offsets obtained by Poseidon have been verified by CCAR, CARB, a California APCD/AQMD or a Third Party Provider.

[40] The fee charged to Poseidon by the CCC for any request to approve additional offset providers pursuant to Section III.C., or to otherwise make the Plan workable by facilitating Poseidon's purchase of offsets/RECs to zero out the Project's net indirect GHG emissions, shall not exceed $5,000.00.

D. Annual Report

Poseidon will provide an Annual GHG Report that will describe and account for Poseidon's annual and cumulative balance of verified net GHG emissions reductions. The Annual GHG Report will include analysis and validation of: (1) the annual GHG emission calculations for the Project, (2) the positive or negative balance in Poseidon's net GHG emissions, (3) the acquisition of offsets and/or RECs in accordance with this Plan, and (4) any other information related to Poseidon's efforts to mitigate GHG emissions resulting from the Project's electricity usage. Each year, Poseidon will obtain the new reported emissions factor from CCAR or CARB and prepare and submit Poseidon's Annual GHG Report within 180 days of the date of publication of CCAR/CARB emissions reports. The Annual GHG Report shall be submitted to the City, and the SLC. In the event that the Annual GHG Report indicates that Poseidon has a positive balance of net GHG emissions for a particular year, Poseidon shall purchase offsets or RECs to cover that balance, and provide the City, CCC and the SLC with documentation substantiating any such purchases, within 120 days of the submission of an Annual GHG Report to the agencies. If an approved Annual GHG Report demonstrates that Poseidon possesses a negative balance of net GHG emissions, Poseidon will be free to carry those surplus offsets forward into subsequent years or sell them on the open market. Beginning with the Sixth Annual Report, Poseidon can comply with its net GHG compliance obligations over any rolling five-year period. Poseidon will purchase enough GHG reductions measures that conform to the Plan such that it will never incur a positive net GHG emissions balance over any rolling five-year period.

Before commencing Project operations, Poseidon shall submit its first Annual GHG Report for review and approval by the City's Planning Director, which will evidence sufficient offsets to zero out the Project's estimated net indirect GHG emissions for the first year, and also shall evidence the one-time purchase of offsets to zero-out the Aggregate 30-Year Construction and Operational GHG Emissions set forth in Table 1 of this Plan (which do not need to be addressed in subsequent reports). All subsequent reports will cover one calendar year.

E. Contingency if No GHG Reduction Projects are Reasonably Available

At any time after submission of its First Annual GHG Report, Poseidon may seek a determination from the City's Planning Director that (i) offset projects in an amount necessary to mitigate the Project's net indirect GHG emissions are not reasonably available; (ii) the "market price" for carbon offsets or RECs is not reasonably discernable; (iii) the market for offsets/RECs is suffering from significant market disruptions or instability; or (iv) the market price has escalated to a level that renders the purchase of offsets/RECs economically infeasible to the Project. Any request submitted by Poseidon shall be considered and a determination made by the City's Planning Director within 60 days. A denial of any such request may be appealed by Poseidon to the City Council for hearing and resolution at the next available meeting date. If Poseidon's request for such a determination is approved by the City's Planning Director or the City Council, Poseidon may, in lieu of funding offset projects or additional offset projects, deposit money into an escrow account (to be approved by the City's Planning Director) to be used to fund GHG offset programs as they become available, with Poseidon to pay into the fund in an amount equal to $10.00 per metric ton for each ton Poseidon has not previously offset, adjusted for inflation from 2008.[41]

The period of time that the conditions giving rise to this contingency remain in effect, and therefore that the escrow account contingency may be utilized under this Section, shall be determined by the City's Planning Director or the City Council at the time Poseidon's request to use the contingency is considered, based on circumstances as they exist at the time of the request. Extensions of the contingency period may be requested and the contingency period shall be extended so long as the conditions giving rise to this contingency period remain in effect. Within 180 days of the City's Planning Director's or the City Council's initial determination pursuant to this Section, Poseidon will be required to submit a plan for the City's Planning Director's approval (the "Contingency Plan") that identifies one or more entities who will utilize monies deposited into the escrow account to implement carbon offset projects. When the escrow account contingency period (together with any extensions thereof) approved by the City's Planning Director or the City Council ends, if the carbon offset projects implemented through the Contingency Plan result in Poseidon having a positive balance of net GHG emissions for the contingency period as calculated under this Plan, then Poseidon shall have three years from the end of the contingency period to purchase offsets or RECs to cover that balance and provide the City, CCC and SLC with documentation substantiating any such purchases.

F. Contingency if New GHG Reduction Regulatory Program is Created

If, at any time during the life of the Project the SCAQMD or any other California APCD/AQMD, or the California Air Resources Board (CARB) or any federal regulatory agency, initiates a carbon tax or carbon offset program that would allow Poseidon to purchase carbon offsets or payment of fees to compensate for GHG emissions, Poseidon may, at its option, elect to pay into such a program in order to fulfill all or part of its obligations under the Plan to offset net indirect GHG emissions caused by the Project. By receiving certification from the relevant receiving entity that Poseidon has satisfied its obligations under the applicable regulatory program, Poseidon will be deemed to have satisfied its obligation under the Plan to offset net indirect GHG emissions for the part of the offset obligations under the Plan for which such certification is made. Subject to the approval of the relevant receiving entity, Poseidon may carry over any surplus offsets acquired pursuant to the Plan for credit in the new regulatory program.

G. Examples of Offset Projects

Offset projects typically fall within the seven major strategies for mitigating carbon emissions set forth below. A similar range and type of offset projects should be expected from a purchase by Poseidon, although it is difficult to anticipate the outcome of Poseidon's offset acquisitions at present.

[41] $10.00 per metric ton is a conservative figure, as offset credits were trading at $1.20 per metric ton on the Chicago Climate Exchange as of market close on May 28, 2009. [Do we have a more current figure?]

1. Energy Efficiency (Project sizes range from: 191,000 metric tons to 392,000 metric tons; life of projects range from: 5 years to 15 years)

- Steam Plant Energy Efficiency Upgrade
- Paper Manufacturer Efficiency Upgrade
- Building Energy Efficiency Upgrades

2. Renewable Energy (Project sizes range from: 24,000 metric tons to 135,000 metric tons; life of projects range from: 10 years to 15 years)

- Small Scale Rural Wind Development
- Innovative Wind Financing
- Other renewable resource projects could come from Solar PV, landfill gas, digester gas, wind, small hydro, and geothermal projects

3. Fuel Replacement (Project size is: 59,000 metric tons; life of project is: 15 years)

- Fuels for Schools Boiler Conversion Program

4. Cogeneration (Project size is: 339,000 metric tons; life of project is: 20 years)

- University Combined Heat & Power

5. Material Substitution (Project size is: 250,000 metric tons; life of project is: 5 years)

- Cool Climate Concrete

6. Transportation Efficiency (Project sizes range from: 90,000 metric tons to 172,000 metric tons; life of projects range from: 5 years to 15 years)

- Truck Stop Electrification
- Traffic Signals Optimization

7. Sequestration (Project sizes range from: 59,000 metric tons to 263,000 metric tons; life of projects range from: 50 years to 100 years)

- Deschutes Riparian Reforestation
- Ecuadorian Rainforest Restoration
- Preservation of a Native Northwest Forest

H. Implementation Schedule

An illustrative schedule setting forth timing for implementation of Poseidon's Plan elements is set forth in the following Implementation Schedule.

Table 10 - Implementation Schedule for the Plan

Measure	Process	Timing
Submit First Annual GHG Report	First Annual Report*, submitted to the City's Planning Director for review and approval, shall include enough detailed emissions reductions measures to achieve a projected zero net GHG emissions balance, and shall include offsets to zero-out the Aggregate 30-Year Construction and Operational GHG Emissions set forth in Table 1.	Before operations commence
Offset and REC Purchases Sufficient to Zero Out Estimated net indirect GHG emissions for first year of operations	Subject to the provisions of Sections III.C, E and F above**,** offset projects or credits, except for RECs, will be implemented through CCAR, CARB or any California APCDs / AQMDs and offset credits will be purchased through CCAR.	Before operations commence
Annual True-Up Process and all Subsequent Annual GHG Reports	Poseidon will submit its Annual GHG Report to the City's Planning Director for review and approval. Once approved, Poseidon will purchase additional offsets as necessary to maintain a zero net GHG emissions balance, or bank or sell surplus offsets. Poseidon can demonstrate compliance over a rolling 5-year period in the Sixth Annual Report	Each year, Poseidon will obtain the new reported emissions factor from CARB or CCAR, and prepare and submit Poseidon's Annual GHG Report within 180 days of the date of publication of CCAR/CARB emissions reports. If the report shows a positive net GHG emissions balance, Poseidon is required to purchase offsets, and submit proof of such purchase to the City within 120 days from the date the Annual GHG Report

*First Annual GHG Report will use projected electricity consumption. All subsequent Annual GHG Reports will use the previous year's electricity consumption data.

I. <u>The Project's Annual Net-Zero Carbon Emission Balance</u>

Table 11 presents a summary of the assessment, reduction and mitigation of GHG emission for the proposed Project. As shown in the table, up to 69-75% of the GHG emissions associated with the proposed Project could be reduced by on-site reduction measures, and the remainder would be mitigated by off-site mitigation projects and purchase of offsets or RECs. It should be noted that on-site GHG reduction activities are expected to increase over the useful life (i.e., in the next 30 years) of the Project because of the following key reasons:

- SCE is planning to increase significantly the percentage of green power sources in its electricity supply portfolio, which in turn will reduce its emissions factor and the Project's net indirect GHG emissions.
- Advances in seawater desalination technology are expected to yield further energy savings and net indirect GHG emission reductions. Over the last 20 years, there has been a 50% reduction in the energy required for seawater desalination.

Table 11 – Expected Assessment, Reduction and Mitigation of GHG Emissions

Part 1: Identification of The Amount of GHG Emitted		
Source	**Total Annual Power Use (MWh/ year)**	**Total Annual Emissions (metric tons CO_2/ year)**
Project Baseline Design	**289,715 to 318,744**	**82,908 to 91,215**
Part 2: On-site and Project-Related Reduction of GHG Emissions		
Reduction due to High-Efficiency Design	(39,500 to 43,200)	(11,300 to 12,360)
Green Building Design	(300 to 500)	(86 to 143)
On-site Solar Power Generation	(0-606)	(0-173)
Recovery of CO_2	(NA)	(1,144)
Reduced Water Importation	(175,500)	(48,190)
Subtotal On-site Reduction Measures	**(215,300 to 219,806)**	**(60,720 to 62,010)**
	Net GHG Emissions	**22,188 to 29,205**
Part 3: Additional Off-Site Reduction of GHG Emissions		
Offset and REC Purchases	(NA)	**22,188 to 29,205**
	Net GHG Emissions	**0**
One-Time Purchase of Offsets for Construction and Operational Emissions		**(6,315 to 6,319)**

Municipal Water District of Orange County
18700 Ward St. • Fountain Valley, CA 92708

Orange County Water Resources Mix and Implications for Desalinated Water Offsets of Imported Water Supplies

April 2010

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Acronyms Used in the Report

AFY	Acre-feet per year
BPP	Basin Production Percentage
GHG	Greenhouse Gas
IRP	Integrated Resources Plan
MAF	Million Acre-Feet
MWDOC	Municipal Water District of Orange County
OCWD	Orange County Water District
TAF	Thousand Acre-Feet

About the Authors

Ed Means

Mr. Means has over 31 years of experience in water planning and policy experience in both the public and private sector, including 18 years with the Metropolitan Water District of Southern California, in a variety of managerial roles. He is deeply knowledgeable in water resources development, having managed over a dozen complex facilitations including indirect potable reuse stakeholder discussion in San Diego, utility regionalization forums in Denver and energy water research plans for the California Energy Commission/AwwaRF). He speaks regularly on water utility trends and management issues. He is the author of two books: Watercourse: Navigating Your Utility's Future (2001) and "A Strategic Assessment of the Future of Water Utilities" (2005) and is contributor to two others: Excellence in Action: Water Utility Management in the 21st Century (2001) and "The Business of Water" (2008). He has published more than 100 articles in industry journals on water resources, management and quality issues.

Michael Hurley

Mr. Hurley has over 17 years of experience in water resources policy, planning and management, including resource program design, supply portfolio management, longterm resources planning, financial analysis and shortage allocation planning. Mr. Hurley previously worked at the Castaic Lake Water District, where he held the position of Water Resources Manager overseeing the agency's water resources planning, including efforts to diversify through the development of recycled water, water transfers and conservation programs.

Prior to that, Mr. Hurley was a Resource Specialist at the Metropolitan where he served as project manager for the agency's 2005 Urban Water Management Plan. Mr. Hurley's other experience at Metropolitan included directing Metropolitan's Water Surplus and Drought Management (WSDM) Technical Team, updating the shortage allocation plan and directing various resource program implementation and long-term resource planning projects. Mr. Hurley also worked for the Colorado River Board of California.

Andree Hunt

Ms. Hunt is an environmental scientist in Malcolm Pirnie's Irvine, CA office where she works on water resources projects. She has experience in water supply and demand analysis, water supply and water conservation projects, urban water management plans, integrated regional water management plans, and drought allocation plans.

Since May 2008, a number of water agencies throughout Orange County (Participating Agencies) have been in discussions with Poseidon Resources (Poseidon) regarding potential long-term water purchase agreement(s) through which some or all of the agencies would purchase water from Poseidon's Huntington Beach Ocean Water Desalination Project (Project), which includes both the desalination plant and the conveyance facilities to deliver water to local and regional distribution pipelines.

In furtherance of this effort, Poseidon developed the Huntington Beach Seawater Desalination Project Energy Minimization and Greenhouse Gas Reduction Plan (Plan) as part of its voluntary commitment to account for and bring to zero net indirect Greenhouse Gas (GHG) emissions from the Project.

The purpose of this report is to analyze the impacts of the delivery of desalinated water supplies from the Huntington Beach Desalination Plant (Project) and determine whether the introduction of Project water into the Orange County's water supply portfolio will result in a net reduction in the demand for imported State Water Project supplies by the Metropolitan Water District of Southern California (Metropolitan). Based on this analysis, Malcolm Pirnie arrived the following conclusions:

- Consistent with the Metropolitan Board adopted Laguna Declaration of 1952, Metropolitan is the supplemental water supplier to Orange County and is prepared to provide its service area with adequate supplies of water to meet projected demand.

- Given the high costs and challenges associated with the delivery of water supplies that must pass through San Francisco Bay/Sacramento-San Joaquin River Delta (Bay-Delta), State Water Project (SWP) supplies will remain as supplemental supplies for Metropolitan. Thus, any new local supply development that reduces the demand for imported supplies will result in a net reduction in SWP supplies or other supplies from northern California.

- Metropolitan's provides financial incentives of up to $250/AF of water produced for qualifying desalination projects in its service area. To qualify for the incentive, proposed projects must replace an existing demand or prevent a new demand on Metropolitan's imported water supplies.

- To date, there is only one project, with a capacity of 56TAF, within the Metropolitan service area that is currently under construction, which represents just 37% of the 150TAF desalination goal discussed in Metropolitan's 2004 Integrated Water Resources Plan (IRP) Update.

- This analysis illustrates that the Project would result in a total net reduction in Metropolitan imported water deliveries of 56,000 AF per year to the Orange County water agencies that purchase water from the Project (Participating Agencies), consistent with the Project's GHG Plan.

- Historical demands for Participating Agencies between FY 1989-1990 and FY 2008-2009 illustrate that these agencies have consistently purchased a minimum of 185,066 AF per year of Metropolitan imported water.

- Historical demands for imported water supplies by the Participating agencies between FY 1989 and FY 2008-2009 exceed potential Project water purchases in all years.

- Projected future demands for imported water supplies by the Participating Agencies total at least 198,119 AF per year, which would be reduced to 142,119 AF per year with Project water purchases.

- Projected demands for each participating agency between 2015 and 2035 illustrate that the projected imported water purchases for each agency exceeds its potential Project water purchase amount in all years.

- Despite significant population growth within Orange County since FY 1989-1990, historical water use has remained relatively consistent. The implementation of water use efficiency measures is credited with reducing per capita water use from an average of 230 gpcd in the late 1980s to the 2005 average of 207 gpcd.[1] . Given the ongoing water conservation efforts and the 20% reduction in urban water use by 2020 mandated under SB x7, water use projections developed by Orange County agencies participating in the Project show that imported water demand will not increase through 2035. Consequently, imported water from the SWP that is replaced by the Project's water is not expected to be imported into Orange County to satisfy water demand from new or expanded uses developed to accommodate population growth.

[1] Source: 2005 MWDOC Urban Water Management Plan, p. 36

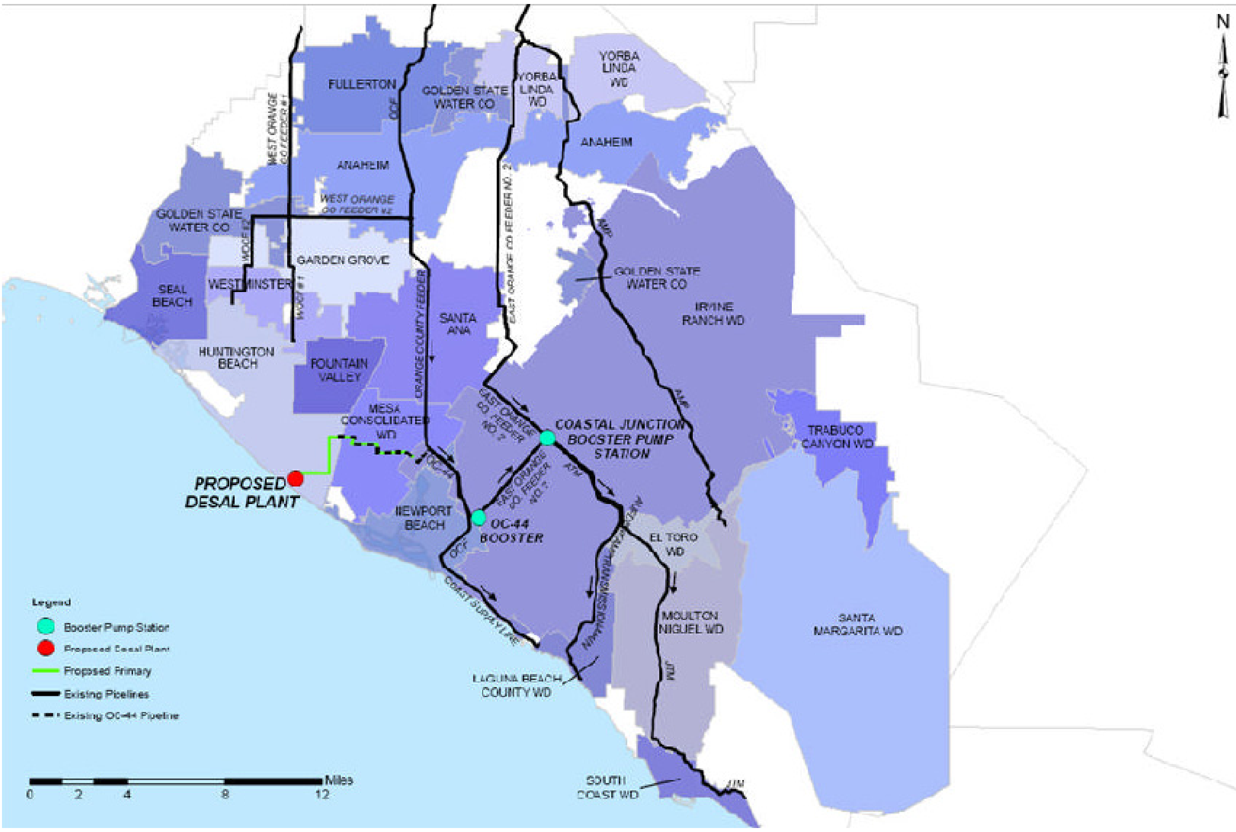
1. Displacement of Imported State Water Project Supplies

In May 2008, Poseidon Resources (Surfside) LLC (Poseidon) entered into a Memorandum of Understanding (MOU) with the Municipal Water District of Orange County (MWDOC) and the following retail water agencies: Mesa Consolidated Water District (Mesa), City of Santa Ana, Irvine Ranch Water District (IRWD), El Toro Water District (ETWD), Santa Margarita Water District (SMWD), Moulton Niguel Water District (MNWD), Laguna Beach County Water District (LBCWD), South Coast Water District (SCWD), Trabuco Canyon Water District (TCWD) and City of Anaheim (collectively the Original Agencies).

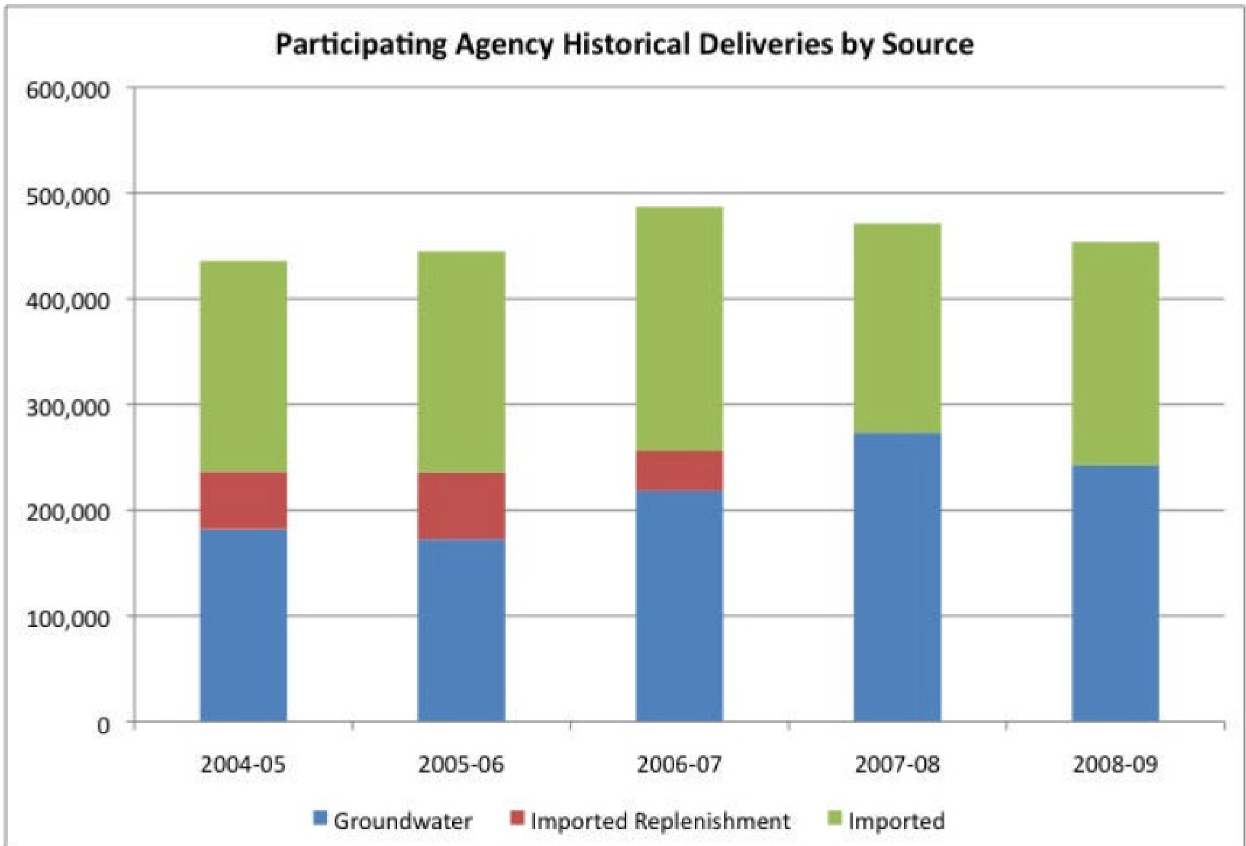
The MOU defines how the parties would interact with each other and outside parties in connection with discussion and negotiation of potential long-term water purchase agreement(s) through which some or all of the Original Agencies would purchase water from Poseidon's Huntington Beach Ocean Water Desalination Project (Project), which includes both the desalination plant and the conveyance facility to deliver water to OC-44, with eventual connection to the East Orange County Feeder #2 (EOCF#2).

As talks with the Original Agencies progressed and feasibility studies were being developed, additional water agencies and a private water company, which were not signatories to the MOU, expressed interest in potentially purchasing desalinated supplies from the Project. In response, in September 2009, the Project was expanded to consider the participation of the following entities: the cities of Fountain Valley, Fullerton, Garden Grove, Huntington Beach, Newport Beach, Seal Beach and Westminster, the Orange County Water District (OCWD), the Yorba Linda Water District (YBWD) and the Golden State Water Company (GSWC). In addition to the their interest in purchasing Project water, certain facilities they currently own or utilize, including the West Orange County Water Board Feeder #2 (WOCWBF#2) were incorporated into the Project analysis. Figure 1-1 depicts the Project area and all potential participants who have expressed interest, henceforth referred to as the Participating Agencies.

Figure 1-1: Huntington Beach Ocean Desalination Project Map



One of the primary reasons for development of the Project is to diversify Orange County's water supply portfolio by replacing some portion of local demand for imported water supplies with locally produced desalinated supplies. Over the last five years, Orange County purchased just under 50% of its water supplies from the Metropolitan Water District of Southern California (Metropolitan). Metropolitan purchases supplement local groundwater supplies, which are limited by the groundwater basin's safe operating range.



Source: MWDOC Historical Water Usage Data, prepared April 2010

Metropolitan is a metropolitan water district created in 1928 by vote of the electorates of several southern California cities. Metropolitan's primary purpose is to provide a supplemental supply of water for domestic and municipal uses and purposes at wholesale rates to its member public agencies. There are 26 member public agencies of Metropolitan, consisting of 14 cities, 11 municipal water districts, and one county water authority. Metropolitan provides 40 to 60 percent of the water used within its service area in any year.

Metropolitan's role as the region's supplemental water supplier is embodied in the Laguna Declaration, adopted by Metropolitan's Board of Directors on December 16, 1952,

> The Metropolitan Water District of Southern California is prepared … to provide its service area with adequate supplies of water to meet expanding and increasing needs in the years ahead. The District is now providing its service area with a supplemental water supply from the Colorado River. When and as additional water resources are required to meet increasing needs for domestic, industrial and municipal water, The Metropolitan Water District of Southern California will be prepared to deliver such supplies.

Metropolitan imports water from two principal sources, the State Water Project (SWP) in Northern California, via the California River Aqueduct (CRA), and the Colorado River, via the Colorado River Aqueduct.

Colorado River Supplies

According to Metropolitan's 2004 Integrated Water Resources Plan (IRP) Update,

> Metropolitan was formed with a primary mission to secure and deliver Colorado River water to Southern California as a supplementary supply to local supplies.

In 1928, Metropolitan began to construct, and in 1941 to operate, the Colorado River Aqueduct (CRA) so that Colorado River water could be delivered to Southern California. The CRA has a capacity of 1,800 cubic feet per second, or 1.3 MAF per year. The CRA conveys water 242 miles from its Lake Havasu intake to its terminal reservoir, Lake Mathews, near the city of Riverside.

California is apportioned the use of 4.4 million acre-feet of water from the Colorado River each year plus one-half of any surplus that may be available for use collectively in Arizona, California and Nevada. In addition, California has historically been allowed to use Colorado River water apportioned to but not used by Arizona or Nevada when such supplies have been requested for use in California. Under the 1931 priority system that has formed the basis for the distribution of Colorado River water made available to California, Metropolitan holds the fourth priority right to 550,000 acre-feet per year. This is the last priority within California's basic apportionment of 4.4 million acre-feet. In addition, Metropolitan holds the fifth priority right to 662,000 acre-feet of water, which is in excess of California's basic apportionment.

Until 2003, Metropolitan had been able to take full advantage of its fifth priority right as a result of the availability of surplus water and apportioned but unused water. These supplies have historically been considered MWD's "baseload" supplies based on their associated costs and reliability. Baseload supplies are used to meet some or all of a given region's continuous water demands, and deliver water at a consistent rate, usually at a low cost relative to other facilities available to the region. However, Arizona and Nevada increased their use of water from the Colorado River, leaving no unused apportionment available for California since 2002. In addition, a severe drought in the Colorado River Basin reduced storage in system reservoirs, such that Metropolitan stopped taking surplus deliveries in 2003 in an effort to mitigate the effects of the drought.

Prior to 2003, Metropolitan could divert over 1.2 million acre-feet in any year and deliveries from 1993 to 2002 averaged 1.1MAF. Since that time, Metropolitan has continued to use CRA deliveries as baseload supplies but net diversions of Colorado River water have been limited to as low approximately 633,000 acre-feet in 2006.

In response to these cutbacks in deliveries, Metropolitan has committed itself to restoring the CRA deliveries and set an IRP target of 1.25MAF per year, which is captured in the 2004 IRP Update. Metropolitan anticipates that its CRA deliveries in 2009 will exceed 1 million acre-feet for the first time since 2002, including diversions anticipated from new programs and transactions under the Five-Year Supply Plan.

State Water Project

Metropolitan's other major source of water is the SWP, which is owned by the State of California and operated by the Department of Water Resources (DWR). This project transports Feather River water stored in and released from Oroville Dam and unregulated flows diverted directly from the San Francisco Bay/Sacramento-San Joaquin River Delta (Bay-Delta) south via the California Aqueduct to four delivery points near the northern and eastern boundaries of Metropolitan's service area.

In 1960, Metropolitan signed a contract with DWR. Metropolitan is one of 29 agencies that have long-term contracts for water service from DWR, and is the largest agency in terms of the number of people it serves (almost 19 million), the share of State Water Project water that it has contracted to receive (approximately 46 percent), and the percentage of total annual payments made to DWR by agencies with State water contracts (approximately 60 percent in 2008).

The State Water Contract, under a 100 percent allocation, provides Metropolitan 1,911,500 acre-feet of water. Because of the higher associated costs, SWP supplies have historically been Metropolitan's "swing" or supplemental supplies, which Metropolitan used to meet variable levels of demand. This is evidenced by the wide range of SWP deliveries to Metropolitan from 1993 to 2002, which show a high of 1.4 MAF to a low of 451 TAF. DWR assumes a 3% conveyance loss for deliveries of SWP supplies via the California Aqueduct to Metropolitan.

Over the last few years, court actions associated with the listing of several fish species (including the Delta smelt) as threatened or endangered under the federal or California Endangered Species Acts have adversely impacted State Water Project operations and limited the flexibility of the SWP. As a result of this court action, the U.S. Fish and Wildlife Service released a new biological opinion on the impacts of the State Water Project and Central Valley Project on Delta smelt on December 15, 2008. Based on the Water Allocation Analysis released by DWR on January 25, 2010, which incorporated the biological opinion's effects on State Water Project operations, export restrictions could reduce deliveries to Metropolitan by 200,000 to 450,000 acre-feet for 2010 under median hydrologic conditions.

Metropolitan and other SWP contractors have filed suit challenging these restrictions, but Metropolitan has also embarked upon efforts to secure additional water resources from the Bay-Delta region including water transfers with the Yuba County Water Agency. However, given the high costs and challenges associated with the delivery of any supplies that must pass through the Bay-Delta, SWP supplies will remain as supplemental supplies for Metropolitan. Thus, new local supply development that reduces the demand for imported supplies will result in a reduction in SWP supplies or other supplies from the Bay-Delta region.

2. Huntington Beach Desalination Project Supply Offset Approach

The Huntington Beach Seawater Desalination Project Energy Minimization and Greenhouse Gas Reduction Plan (Plan) has been developed by Poseidon Resources Surfside LLC (Poseidon) as part of its voluntary commitment to account for and bring to zero net indirect Greenhouse Gas (GHG) emissions from the Project. The Plan is substantially the same as the Energy Minimization and Greenhouse Gas Reduction Plan for the Carlsbad Desalination Plant, which was supported by the California Air Resources Board (CARB) and approved by the California Coastal Commission (CCC) and the California State Lands Commissions (SLC) for the Carlsbad Desalination Project.

2.1 Overview of the Project's GHG Reduction Strategy

The Plan establishes a protocol for identifying, securing, monitoring and updating measures to eliminate the Project's net carbon footprint. The protocol involves the following steps, which will be completed each year over the 30-year life of the Project:

1. Determine the energy consumed by the Project from the previous year using substation(s) electric meter readings from Southern California Edison (SCE).

2. Determine SCE's reported emissions factor from the appropriate CCAR, The Climate Registry (TCR), or CARB reported emissions factor. If the Project obtains all or part of its electricity from an entity other than SCE, the appropriate reported emissions factor for that entity shall be used.

3. Calculate the Project's gross indirect GHG emissions by multiplying its electricity use by the reported emissions factor.

4. Calculate the Project's net indirect GHG emissions by subtracting emissions avoided as a result of the Project (Avoided Emissions) and any existing offset projects and/or Renewable Energy Credits (RECs). Each year's amount of net indirect GHG emissions will be determined using CARB, TCR, or CCAR reported emissions for SCE and/or the SWP.

5. If necessary, implement carbon offset projects and purchase carbon offsets or RECs to zero out the Project's net indirect GHG emissions.

2.2 Avoided Emissions from Displaced Imported Water

One source of Avoided Emissions identified in the Plan is the displacement of imported water now delivered to Participating Agencies from the SWP. The Plan states that the 56,000 AFY of water supplied to Orange County will provide direct, one-to-one replacement of imported water to meet the requirements of the Participating Agencies, thus eliminating the need to pump 56,000 AFY of water into the region. As a result of a 2003 multi-state Colorado River quantitative settlement which forced Metropolitan to reduce its pumping from the Colorado River by 53% (from 1.2 MAFY to 0.6 MAFY), Metropolitan now operates its delivery system to base load its Colorado River allotment and draw from the SWP as needed to serve demand that cannot be met by lower cost Colorado River Aqueduct water. Consequently, the proposed Project will reduce Metropolitan's demand on the SWP.

The California Air Resources Board (CARB) analyzed the Energy Minimization and Greenhouse Gas Reduction Plan for the Carlsbad Desalination Plant, which is substantially identical to the Plan for this Project. In a letter dated August 5, 2008 from CARB to the California Coastal Commission, CARB indicated that it had analyzed the Energy Minimization and Greenhouse Gas Reduction Plan for the Carlsbad Desalination Plant, and that the amount of emissions reduction that should be required "need not exceed the net impact; that is, the direct emissions and any new indirect emissions from the project, less emissions that would be associated with providing an equivalent amount from existing supplies" (CARB 2008b). Moreover, the CARB letter notes that the GHG plan for Carlsbad was offered voluntarily, and further notes that the direct emissions from that project were minimal.

Because the project would displace the customers' use of 56,000 AF of imported water per year to Orange County, once in operation, the project would also avoid the energy required to deliver that water to Orange County, as well as the GHG emissions associated with pumping, treatment, and distribution to the project's customers of this imported water. In January 2009, Metropolitan and the San Diego County Water Authority (Water Authority) submitted a letter to the California Coastal Commission recognizing the longterm displacement of imported supplies from Poseidon's Carlsbad Seawater Desalination Project, which is similar and size and scope to the proposed Huntington Beach Project[2]. In that letter, Metropolitan communicated the following:

> The Water Authority service area is dependent on imported water supplies. Once operating, the Carlsbad Project will result in an equal demand reduction for both the Water Authority's and MWD's imported supplies. This will allow MWD, on a long-term average basis, to reduce its need for expanded transfers and exchanges. Likewise, the Water Authority will reduce its need for marginal supplies, including transfers, due to the production of 56,000 acre-feet of local supplies annually by the Carlsbad Project.

Consistent with that CARB and Metropolitan findings for the Carlsbad Desalination Plant, the Project will avoid the energy required to deliver imported water to Orange County by displacing 56,000 AFY of imported water demand.

[2] Jeff Kightlinger and Maureen Stapleton, Letter to Peter Douglas, Questions Regarding the Carslbad Seawater Desalination Project and Imported Water Demand, January 20, 2010.

3. Metropolitan Water District Seawater Desalination Program

The California Water Plan Update 2009 (Bulletin 160-09) released on March 30, 2010 (DWR 2010b) recognizes that one of the potential benefits that seawater desalination can provide is, "Increased water supply reliability during drought periods" (DWR 2010b, Volume 2, Resource Management Strategies, Chapter 9, p. 9-9.) Because the supply available from the Pacific Ocean is not affected by drought conditions, the Seawater Desalination Project at Huntington Beach would add even more flexibility and reliability in operating California's water system, and it would provide particular drought relief in Orange County.

Metropolitan has adopted a regional facilitator role to assist in the development of seawater desalination. In this capacity, Metropolitan staff assists member agencies in the resolution of technical issues through research and development, supports member agencies in seeking regulatory clearance for projects, and coordinates the review of unsolicited third party proposals for projects.

3.1 Seawater Desalination Program

3.1.1 Background

The Seawater Desalination Program (SDP) provides incentives for development of new seawater desalination projects in Metropolitan's service area. The policy principles for the SDP were adopted by Metropolitan's Board in February 2001.

The SDP Administrative Guidelines identify the following key goals for the program:

- Assist local projects that improve regional water supply reliability and avoid or defer MWD capital expenditures;
- Emphasize cost-efficient participation in projects;
- Financial assistance to sponsoring member agencies of up to $250 per AF based on project production for agreement terms up to 25 years; and · Schedule project production according to regional need.

In November 2001, Metropolitan issued a request for competitive proposals (RFP) soliciting seawater desalination project proposals sponsored by member agencies. Metropolitan received five proposals that would result in a total of 142,000 AF of annual production. In light of the enthusiastic response to the proposals submitted under the RFP, the 2004 IRP Update included a revised local resources target that can accommodate a seawater desalination goal of 150,000 acre-feet.

Under the SDP, Metropolitan provides incentives up to $250 per acre-foot for locally produced seawater desalination projects that reduce the need for imported supplies. The incentives are provided based on the difference between actual project unit costs and Metropolitan treated water rates. To qualify for the incentive, proposed projects must replace an existing demand or prevent a new demand on Metropolitan's imported water supplies.[3]

To date, the only proposal to move forward to the start of construction is the Carlsbad Desalination Program discussed below. This Project represents 56 TAF of the 150 TAF desalination goal discussed in the 2004 IRP Update.

3.1.2 Seawater Desalination Program Agreement for the Carlsbad Desalination Program

In November 2009, the Metropolitan Board voted to enter into a SDP Agreement with San Diego County Water Authority and its retail agencies for 56,000 AFY for the Carlsbad Desalination Project. Under separate agreements, Poseidon would sell water from the project to nine SDCWA retail member agencies: Carlsbad Municipal Water District, Santa Fe Irrigation District, Valley Center Municipal Water District, Vallecitos Water District, Rincon del Diablo Municipal Water District, Olivenhain Municipal Water District, Sweetwater Authority, city of Oceanside, and Rainbow Municipal Water District. Water would be delivered to these agencies via project transmission pipelines or through SDCWA's distribution system as blended or exchanged supplies. SDCWA is currently developing separate agreements with the nine local retail agencies to facilitate pass-through of incentives and integrate deliveries with SDCWA's system operations.

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[3] Metropolitan April 10, 2007 Board Letter, Attachment 1 (Local Resources Program Overarching Elements).

4. Historical Orange County Water Supply Mix

To determine the historical supply mix for the Participating Agencies, historical water usage by supply type was reviewed and analyzed. MWDOC staff provided data for each agency for the past five years (FY 2004-04 to FY 2008-09) and in five-year increments from FY 1989-1990 to FY 1990-2000.

Existing major water sources for the Participating Agencies include:

- **Groundwater:** Of those Participating Agencies that are groundwater producers, most pump their groundwater supplies from the Lower Santa Ana River Basin, which is managed by the Orange County Water District (OCWD). The primary mechanism used by OCWD to manage pumping is the Basin Production Percentage (BPP). The BPP is the percentage of each producer's total water supply that comes from groundwater pumped from the basin. The BPP is set uniformly for all producers. Groundwater production at or below the BPP is assessed a Replenishment Assessment, which is significantly lower than the Metropolitan rate. Pumping above the BPP is also assessed a Basin Equity Assessment, which is calculated so that the cost of groundwater production is higher than the cost of Metropolitan imported water.[4] Consequently, agencies typically pump to the BPP and purchase imported water to meet their remaining demands.

- **Imported Water:** All Participating Agencies currently purchase all or a portion of their imported water supplies either directly or indirectly from Metropolitan. Deliveries to the Participating Agencies have two classes of water service:

  - *Full Service:* Full service water service, formerly known as non-interruptible water service, includes water sold for domestic and municipal uses. Full service treated water rates are the sum of the applicable supply rate, system access rate, water stewardship rate, system power rate and treatment surcharge.

  - *Replenishment:* Replenishment water is sold at a discounted rate to member agencies that store water and subsequently use the water to offset demands on Metropolitan in times of shortage. Orange County agencies have historically received delivery via in-lieu deliveries to storage. Under in-lieu deliveries, Metropolitan delivers replenishment water directly to the member agency's distribution system. The member agency then delivers this water rather than producing water from local groundwater sources. Metropolitan ceased deliveries under the Replenishment Program on May 1, 2007. Deliveries under the Replenishment Program are not expected to occur until water supply conditions improve.

- **Recycled (Non-Potable) Water:** Some participating agencies also have nonpotable recycled water supplies, which are generally used for irrigation.

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[4] Source: OCWD 2009 Groundwater Management Plan.

Agencies have historically maximized the use of groundwater and minimized the use of imported water due to the cost difference between these supplies.

Table 4.1 shows the percentage of historical supplies by source for the Participating Agencies. As this data illustrates, imported water has consistently supplied over 40 percent of the Participating Agency's demands for the past 20 years.

Table 4-1: Agencies Historical Supplies by Source[5]

Source	Fiscal Year							
	1989-90	1994-95	1999-00	2004-05	2005-06	2006-07	2007-08	2008-09
Groundwater	170,408	213,436	239,745	182,056	172,433	218,123	273,200	242,407
Imported – Full Service	268,321	185,066	212,561	199,197	208,992	230,741	197,957	211,213
Imported – Replenishment	31,572	15,512	35,759	54,306	63,345	38,032	-	-
Recycled	16,292	17,912	26,354	25,140	27,196	31,974	32,651	36,668
Total	**486,593**	**431,926**	**514,419**	**460,699**	**471,966**	**518,871**	**503,808**	**490,288**

Source: MWDOC Historical Water Usage Data, prepared April 2010

For the purposes of this analysis, the Participating Agency were broken out by Metropolitan member agency and the historical imported water demands were assessed both for individual Metropolitan member agency and for the collective group to determine the impact that Project water purchases would have on Orange County's demand for imported water. Each Metropolitan member agency's historical imported water purchases are shown in Table 4.2. As illustrated in the table, imported water usage among Participating Agencies has historically been significantly higher than the projected Project water deliveries.

[5] Irvine Lake surface water is not included as it is not possible to determine actual surface water usage on an annual basis and the supplies represent only a fraction of a percent of total supplies.

Table 4-2: Historical Imported Water Use by Metropolitan Member Agency

	1989-90	1994-95	1999-00	2004-05	2005-06	2006-07	2007-08	2008-09
MWDOC	216,164	151,824	172,510	151,435	155,433	182,005	164,941	166,132
Anaheim	21,811	16,098	19,824	22,145	26,122	23,949	15,272	22,617
Fullerton	14,511	6,865	7,452	10,638	11,450	10,443	9,225	9,711
Santa Ana	15,838	10,281	12,776	14,980	15,988	14,344	8,521	12,753
Total	**268,321**	**185,066**	**212,561**	**199,197**	**208,992**	**230,741**	**197,957**	**211,213**

The next step in the analysis was to verify that, based on historical deliveries, only imported water demands would be offset by Project water purchases for each of the Metropolitan member agencies. To accomplish this, each agency's historical demands were graphed with its potential Project water purchase amount as represented in each agency's Letter of Intent (LOI) were included on the graph as the new base-load supply. These graphs illustrate which historical deliveries would no longer be needed as a result of the new Project water supply.

For the purposed of this analysis, the Project water purchase amounts equal the Project's 56,000 AFY capacity. However, as shown in Table 4.3, the LOI purchase amounts of the four Metropolitan member agencies as of April 12, 2010 exceed the Projects capacity.

Table 4-3: Letter of Intent Purchase Amounts

Agency	LOI Demand (AFY)	LOI Demand (MGD)
MWDOC Member Agencies	59,610	46.2
City of Anaheim	3,000	2.7
City of Fullerton	2,500	2.2
City of Santa Ana	3,000	2.7
Total	***68,110***	***53.8***

In addition, MWDOC has also submitted an LOI for an additional 20 TAF, which brings the LOI purchase amounts to 88,100 AF

Figures 4-1 through 4-4 illustrate the following:

- For all participating agencies, Project water purchases would have offset only imported water purchases historically based on the data analysis from FY 1989-1990 though FY 2008-2009.

Figure 4-1: MWDOC Historical Deliveries with Desal Baseload

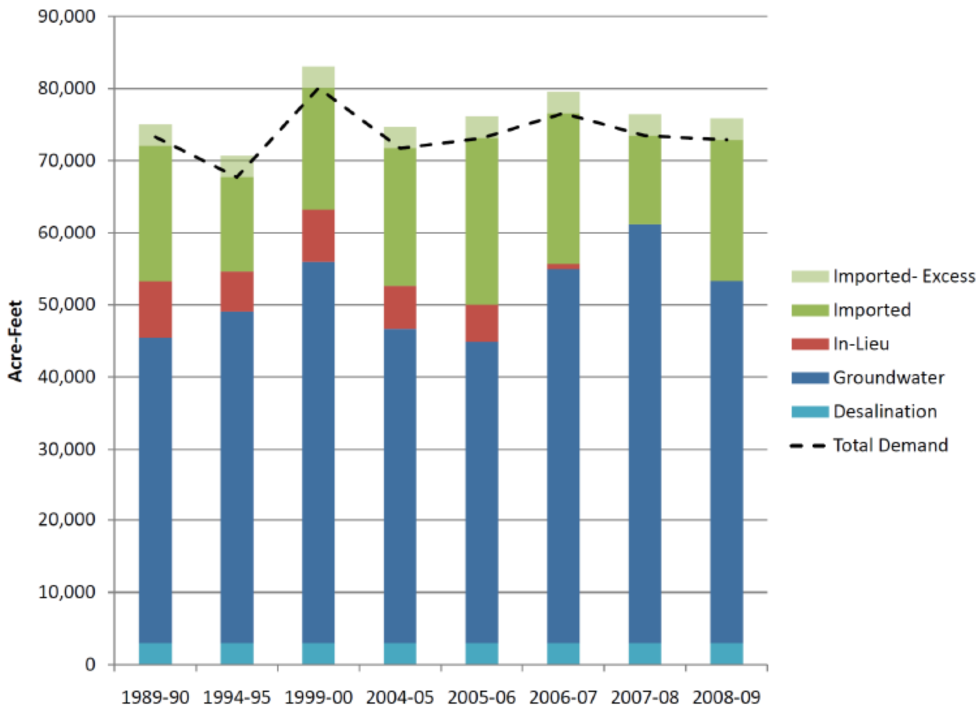


Figure 4-2: Anaheim Historical Deliveries with Desal Baseload

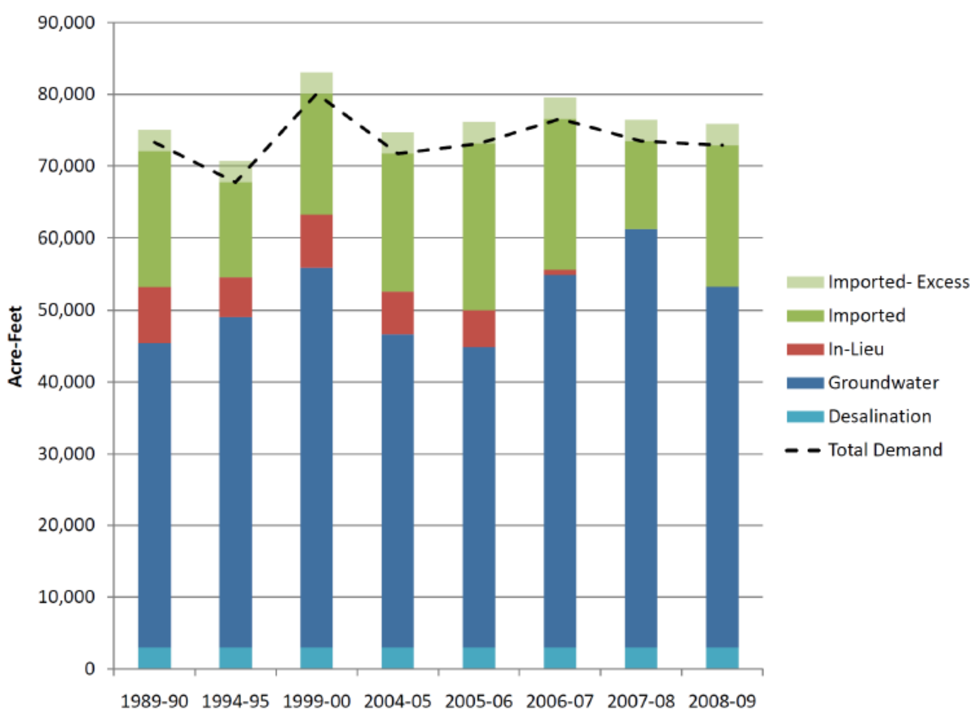


Figure 4-3: Fullerton Historical Deliveries with Desal Baseload

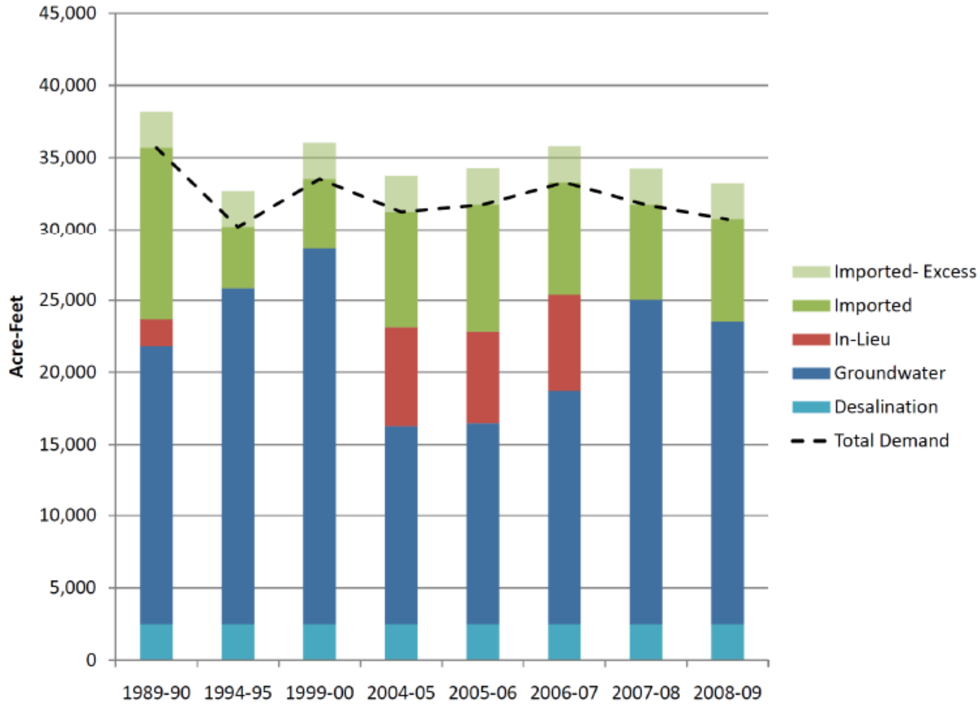
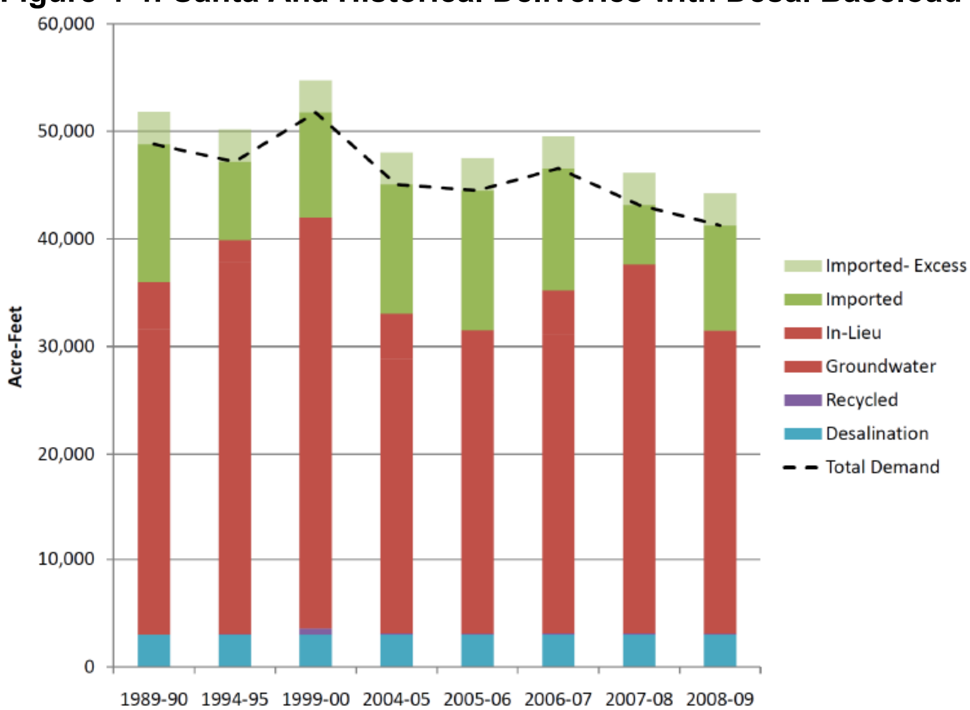


Figure 4-4: Santa Ana Historical Deliveries with Desal Baseload



5. Orange County Water Supply Mix Projection

The next step in the analysis was to review long-term supply and demand projections from the agencies. Supply and demand projections were obtained from MWDOC. MWDOC compiled these projections through its annual demand surveys of member agencies and other Metropolitan customers within Orange County.

Factors resulting in differences between historical supplies and demands and future projections include:

- Groundwater Supplies: While historically the BPP was above 70 percent in a normal year, the BPP is projected to remain between 60 percent and 65 percent long-term. This is due to a lack of replenishment supplies, annexations into the service area resulting in an increase in demand, and hydrologic conditions. A BPP of 65 percent has been used for this analysis to conservatively reflect imported water demand projections.

- SB x7: In February 2008, Governor Schwarzenegger introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. As part of this effort, the Governor directed state agencies to develop a plan to reduce statewide per capita urban water use by 20 percent by the year 2020. For the purposes of this analysis, agencies demands were reduced by 20% starting in 2020 except where recycled supplies were sufficient to meet the 20% x 2020 requirements. As a result of SB x7 and ongoing conservation efforts, it is expected that water demands in Orange County will not increase through 2035 despite population growth.

- Planned local supplies: In addition to the Project, many Participating Agencies are taking additional steps to improve local supply reliability and reduce dependence on Metropolitan. Such projects include addition or expansion of water recycling facilities.

Table 5-1: Agencies Projected Supplies by Source

Source	2015	2020	2025	2030	2035
Recycled Water	50,879	54,865	58,190	58,158	58,163
GW	237,866	258,360	265,312	267,035	268,656
Other	28,738	27,044	27,130	27,212	27,247
Imported Water	198,178	170,863	176,217	177,711	178,397
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Metropolitan member agency projected imported water demands were assessed both for individual agencies and for the collective group to determine the impact that Project water purchases would have on Orange County's demand for imported water. Each Metropolitan member agency's projected imported water purchases are shown in Table 5.2. As illustrated in the table, projected water usage among the agencies is significantly higher than the projected Project water deliveries.

Table 5-2: Projected Imported Water Use by Metropolitan Member Agency

Agency	2015	2020	2025	2030	2035
MWDOC	142,109	132,059	136,799	138,236	138,883
Anaheim	22,833	13,014	13,131	13,149	13,149
Fullerton	12,160	11,200	11,200	11,200	11,200
Santa Ana	21,076	14,590	15,087	15,126	15,165
Total	**198,178**	**162,513**	**167,826**	**169,309**	**169,995**

To verify that only imported water demands would be offset by Project water purchases for each of the Metropolitan member agencies, each agency's projected demands were graphed with its potential Project water purchase amount included on the graph as the new base-load supply. These graphs illustrate which historical deliveries would no longer be needed as a result of the new Project water supply.

As with the comparison with historical deliveries, this analysis assumes the Project water purchase amounts are equal the Project's 56,000 AFY capacity. However, as shown in Table 5.3, the LOI purchase amounts of the four Metropolitan member agencies as of April 12, 2010 exceeds the Projects capacity.

Table 5-3: Letter of Intent Purchase Amounts

Agency	LOI Demand (AFY)	LOI Demand (MGD)
MWDOC Member Agencies	59,610	46.2
City of Anaheim	3,000	2.7
City of Fullerton	2,500	2.2
City of Santa Ana	3,000	2.7
Total	***68,110***	***53.8***

The following figures (Figures 5-1 through 5-4) illustrate that each Metropolitan member agency's projected imported water use in each year through 2035 exceeds its potential Project water purchase amount. Therefore, the project would offset only imported water purchases over the Project life as specified in the GHG reduction plan.

Figure 5-1: MWDOC Projected Deliveries with Desal Baseload

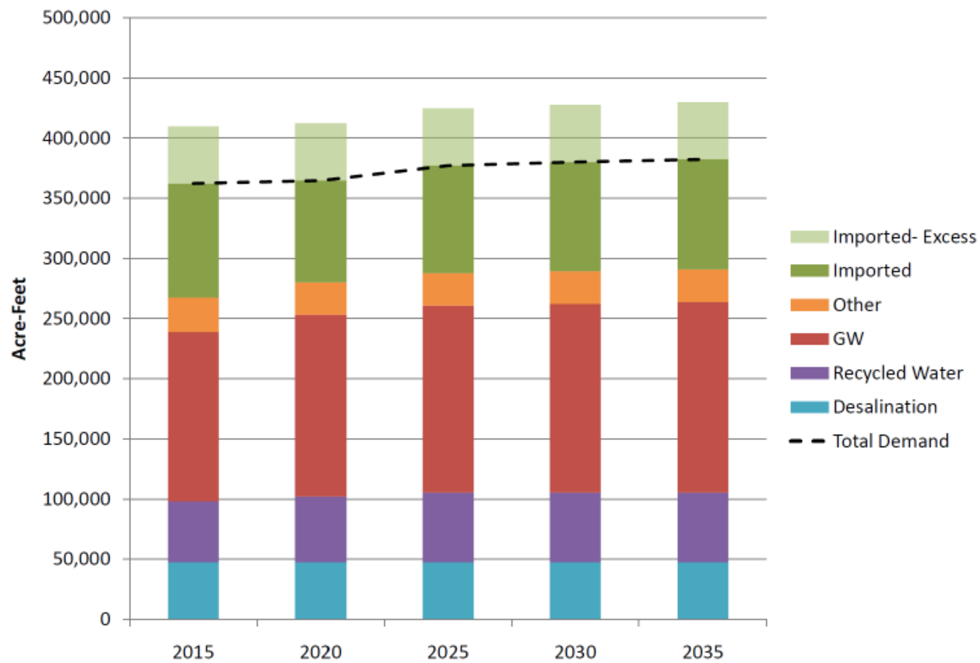


Figure 5-2: Anaheim Projected Deliveries with Desal Baseload

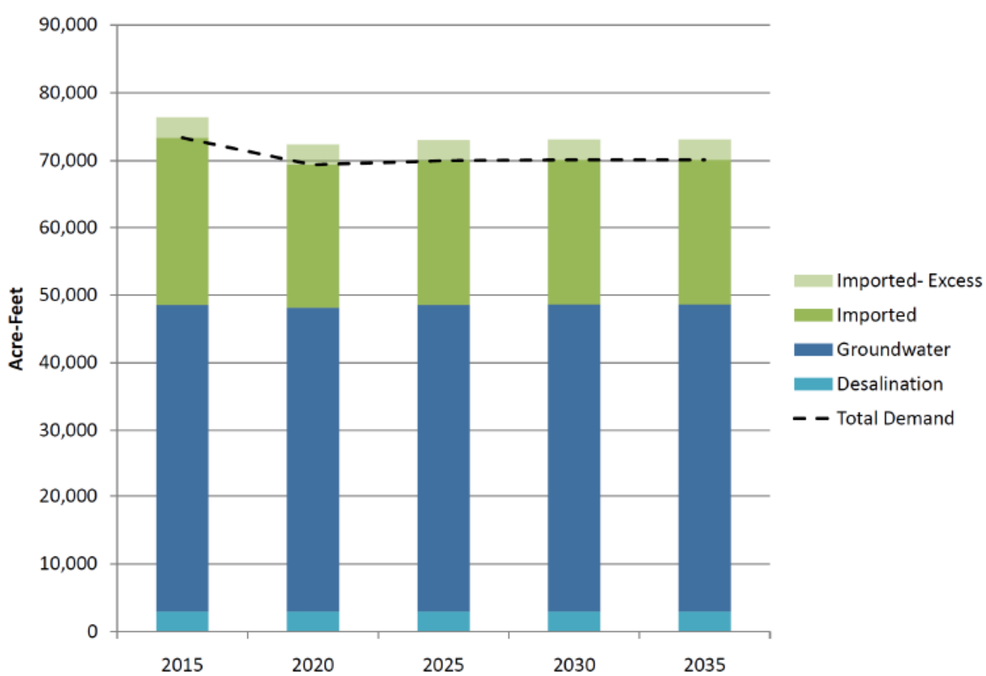


Figure 5-3: Fullerton Projected Deliveries with Desal Baseload

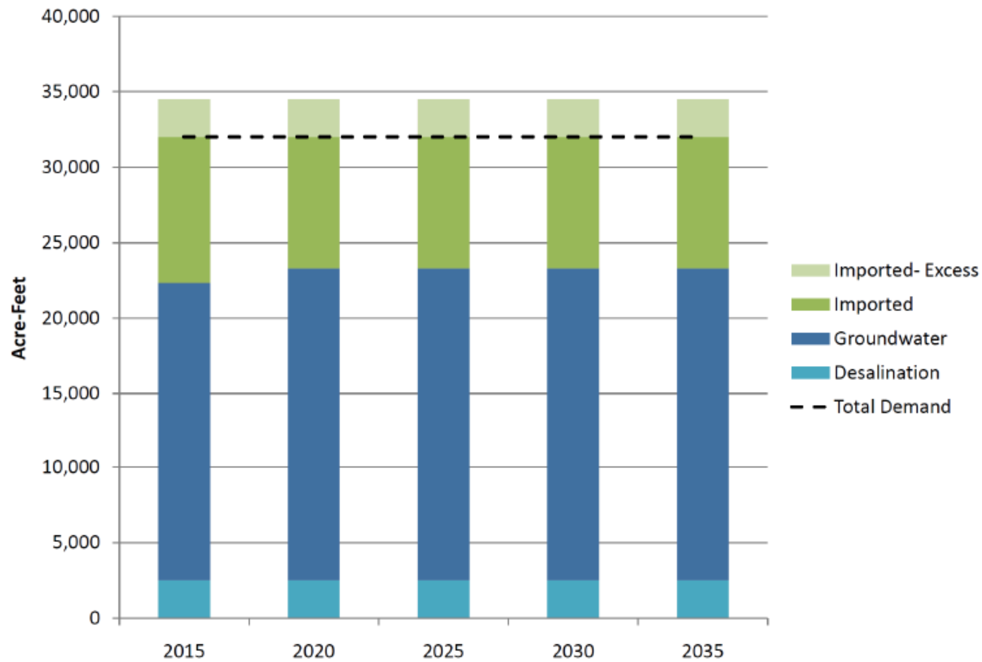


Figure 5-4: Santa Ana Projected Deliveries with Desal Baseload

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6. Conclusions

Based on this analysis, Malcolm Pirnie has developed the following conclusions:

- Consistent with the Metropolitan Board adopted Laguna Declaration of 1952, Metropolitan is the supplemental water supplier to Orange County and is prepared to provide its service area with adequate supplies of water to meet projected demand.

- Given the high costs and challenges associated with the delivery of water supplies that must pass through San Francisco Bay/Sacramento-San Joaquin River Delta (Bay-Delta), State Water Project (SWP) supplies will remain as supplemental supplies for Metropolitan. Thus, any new local supply development that reduces the demand for imported supplies will result in a net reduction in SWP supplies or other supplies from northern California.

- Metropolitan provides financial incentives of up to $250/AF of water produced for qualifying desalination projects in its service area. . To qualify for the incentive, proposed projects must replace an existing demand or prevent a new demand on Metropolitan's imported water supplies.

- To date, there is only one project, with a capacity of 56TAF, within the Metropolitan service area that is currently under construction, which represents just 37% of the 150TAF desalination goal discussed in Metropolitan's 2004 Integrated Water Resources Plan (IRP) Update.

- This analysis illustrate that the Project would result in a total net reduction in Metropolitan imported water deliveries of 56,000 AF per year to the Orange County water agencies that purchase water from the Project (Participating Agencies), consistent with the Project's GHG Plan.

- Historical demands for Participating Agencies between FY 1989-1990 and FY 2008-2009 illustrate that these agencies have consistently purchased a minimum of 185,066 AF per year of Metropolitan imported water.

- Historical demands for imported water supplies by the Participating agencies between FY 1989 and FY 2008-2009 exceed potential Project water purchases in all years.

- Projected future demands for imported water supplies by the Participating Agencies total at least 198,119 AF per year, which would be reduced to 142,119 AF per year with Project water purchases.

- Projected demands for each participating agency between 2015 and 2035 illustrate that the projected imported water purchases for each agency exceeds its potential Project water purchase amount in all years.

- Despite significant population growth within Orange County since FY 1989-1990, historical water use has remained relatively consistent. The implementation of water use efficiency measures is credited with reducing per capita water use from an average of 230 gpcd in the late 1980s to the 2005 average of 207 gpcd.[6] . Given the ongoing water conservation efforts and the 20% reduction in urban water use by 2020 mandated under SB x7, water use projections developed by Orange County agencies participating in the Project show that imported water demand will not increase through 2035. Consequently, imported water from the SWP that is replaced by the Project's water is not expected to be imported into Orange County to satisfy water demand from new or expanded uses developed to accommodate population growth.

[6] Source: 2005 MWDOC Urban Water Management Plan, p. 36

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